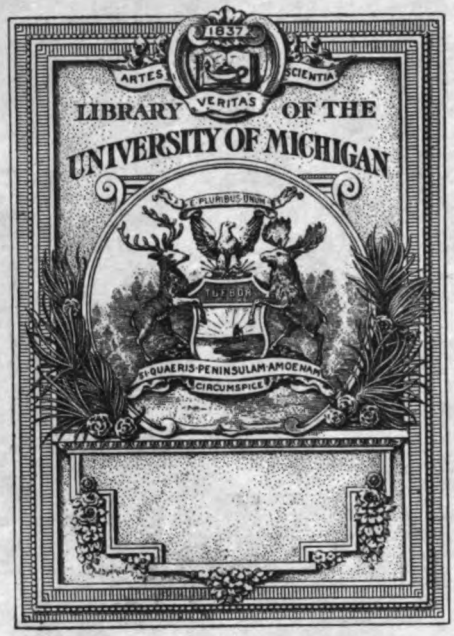
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THE JOURNAL OF
Tropical Medicine and Hygiene

With which is incorporated "CLIMATE"

AND

Embodying Selections from THE COLONIAL MEDICAL REPORTS.

A BI-MONTHLY JOURNAL DEVOTED TO MEDICAL, SURGICAL AND SANITARY WORK IN THE TROPICS

EDITED BY

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SIR RONALD ROSS, C.B., F.R.S., MAJOR I.M.S. (*Honorary Adviser to the Editorial Staff*)

VOLUME XV

JANUARY 1 TO DECEMBER 16

1912

LONDON

JOHN BALE, SONS & DANIELSSON, LTD.

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Original Communications.

OBSERVATIONS ON THE EFFECT OF VARIOUS DRUGS IN EXPELLING HOOK-WORMS.

By Burton Nicol, F.R.C.S.Eng., D.P.H.Camb.

Medical Superintendent, Indian Immigration Trust Board of Natal.

THE observations that had already been made[1] on the use of anthelmintics led to the adoption of beta-naphthol by the Indian Immigration Trust Board as the most effective anthelmintic for the expulsion of hook-worms. All indentured Indians on their arrival in this province were accordingly treated with this drug before they were sent out to their employers. Microscopic examination of the stools one week or more after treatment was in these observations relied upon for the result which was based upon the number of negatives observed. The result of the examinations seemed to show that in equal doses beta-naphthol was more effective in expelling hook-worms than thymol.

In the present series of observations effort has been made to ascertain the effect of the various drugs employed by a careful examination of the stools and the recovery and enumerations of all the hook-worms expelled. The action of eucalyptus, izal, pelletierine tannate, thymol and beta-naphthol have in this way been tested, each individual receiving repeated treatments with one of these drugs until no more hook-worms were expelled.

Thymol was the first drug used. The men selected, ten newly arrived male adult immigrants, were given a light meal of sago instead of the usual meal of curry and rice for their last meal on the day preceding treatment; on the evening of the same day each man was given an aperient consisting of 6 drachms of sulphate of magnesia. On the following day no food was given until about two hours after the last dose of medicine had been taken. The drug was given in the following way:—

At 6 a.m.	.. ..	30 gr. of thymol.
,, 8 ,,	.. ..	30 ,, ,,
,, 10 ,,	.. ..	30 ,, ,,
,, 12 o'clock noon	..	6 dr. sulphate of magnesia.

The stools passed after the first dose of medicine had been taken, together with the first stool passed on the following morning, were collected and washed through a wire sieve; all the hook-worms were removed, and the numbers present noted. Elaborate precautions were taken to ensure accuracy in results, each stool being washed by itself, and carefully examined. The results were as follows:—

[1] "Beta-Naphthol and Thymol as Anthelmintics," Journal of Tropical Medicine and Hygiene, February, 1911.

Case No.	Number of Hook-worms Expelled: First treatment	Second treatment	Third treatment
1	1	0	0
2	9	0	0
3	4	0	0
4	10	0	0
5	12	2	0
6	4	0	0
7	11	0	0
8	0	0	—
9	27	0	0
10	15	0	0
Totals	93	2	0
Proportion expelled	97·87	2·13	0·0 per cent.

Eucalyptus was the next drug tested; this was given in the manner suggested by Phillips.[2] Each man had a light meal of sago on the afternoon of the day preceding treatment in place of the usual meal of curry and rice, and at night was given 6 drachms of castor oil. The next morning at 6 a.m. we gave to each half of the following mixture:—

Eucalyptus oil	2·50 grm.
Chloroform	3·50 ,,
Castor oil	40 ,,

The remaining portion was given in half an hour's time. All the stools were collected on this day, together with the first stool passed on the following morning; these were all washed through a wire sieve, and the parasites collected as before. The results were as follows:—

Case No.	Number of Hook-worms Expelled: First treatment	Second treatment	Third treatment	Fourth treatment	Fifth treatment	Sixth treatment
1	28	5	13	0	0	—
2	10	0	9	0	0	—
3	6	0	2	0	0	—
4	28	0	15	2	0	0
5	10	1	0	1	0	0
6	2	0	0	—	—	—
7	15	0	0	—	—	—
8	0	2	0	0	—	—
9	1	0	0	—	—	—
10	96	11	6	0	1	0
Totals	196	19	45	3	1	0
Proportion expelled	74·2	7·2	17·0	1·13	0·37	0·0 %

The next test was made with pelletierine tannate, which had been tried by one of our medical officers and from the clinical point of view seemed to give good results. In the notes sent to me, it was pointed out that the tannate which was only slightly soluble in water should be used in preference to the sulphate which is freely soluble, and might give rise to symptoms of pomegranate poisoning. The drug, which deteriorates on exposure to air, was procured

[2] *Vide* Phillips, *Lancet*, 1906.

in Burroughs Wellcome & Co.'s sealed tubes containing 60 gr. each. It was given in 12-gr. doses, the powder being placed dry on the tongue and washed down with water. The men were given sago for the last meal on the day preceding treatment, and an ounce of castor oil was given to each one at night in order to thoroughly empty the bowels.

The pelletierine was given at 6 a.m. on the following morning, and was followed by another ounce of castor oil at 10 a.m. The stools were collected for the next twenty-four hours, and carefully examined, but no parasites were discovered. The treatment was repeated in a week's time with a similar result, the drug, so far as hook-worms are concerned, being evidently quite inert.

The ten men who had taken the pelletierine twice without effect were now, after a week's interval, given beta-naphthol in two doses of 30 gr. each. The usual precautions were taken by starving, and preliminary purgation to ensure emptiness of the bowel, and the drug was given in the following way :—

At 6 a.m. .. 30 gr. beta-naphthol.
,, 8 ,, .. 30 ,, ,,
,, 10 ,, .. 6 dr. sulphate of magnesia.

This treatment was repeated at intervals of a week, until no more parasites were expelled. The results were :—

Case No.	Number of Hook-worms Expelled: First treatment	Second treatment	Third treatment
1	65	19	0
2	2	0	0
3	43	0	0
4	8	5	0
5	60	4	0
6	2	0	0
7	3	0	0
8	6	1	0
9	7	3	0
10	1	0	0
—	—	—	—
Total	197	32	0
Percentages	86	14	0·0 per cent.

Observations were next made upon the effect of izal in expelling hook-worms. Thirteen men were placed under treatment, each of whom was dieted carefully, and purged before the drug was given. The administration was carried out as follows :—

At 6 a.m. .. Izal 80 m with chloroform water 2 oz.
,, 8 ,, .. ,, ,, ,, ,,
,, 10 ,, .. ,, ,, ,, ,,
,, 12 noon .. Castor oil 1 oz.

The stools were all collected, from the time the first dose of medicine was given, for the succeeding twenty-four hours, and were examined in the usual manner. It was noticed that the number of parasites recovered was very small; in the last nine cases, therefore, all the stools were collected for forty-eight hours. The results were :—

Case No.	Number of Hook-worms Expelled: First treatment	Second treatment	Third treatment
1	8	0	0
2	2	6	0
3	8	0	0
4	42	2	0
5	6	0	0
6	0	0	—
7	0	0	—
8	3	0	0
9	8	1	0
10	5	0	0
11	3	0	0
12	12	2	0
13	2	0	0
Totals	99	11	0
Proportion expelled	90	10	0·0 per cent.

In the next series of observations, beta-naphthol was again given. On this occasion the drug was given by what may now be called the Natal method, viz., three doses of 30 gr. each. Ten men were at first selected and when the observations on these were completed another thirty were put through the same treatment. In each case the individual was carefully dieted on the day before treatment and a saline purgative of 6 drachms of sulphate of magnesia was given the night before. The drug was given in the following manner :—

At 6 a.m. .. 30 gr. beta-naphthol.
,, 8 ,, .. 30 ,, ,,
,, 10 ,, .. 30 ,, ,,
,, 12 noon .. 6 dr. sulphate of magnesia.

All the stools passed subsequent to the taking of the first dose of medicine were collected, washed through a wire sieve in the usual way, and the number of hook-worms carefully recorded. For convenience of administration the beta-naphthol was given in the following form :—

Beta-naphthol .. .. 4 dr.
Mucilage of tragacanth .. .. .. 1 oz.
Peppermint water to .. .. .. 6 oz.
(This mixture contains 5 gr. of beta-naphthol in each fluid drachm.)

The beta-naphthol, which is a crystalline powder, is carefully triturated in order to reduce it to as fine a state of sub-division as possible, the mucilage and water being afterwards added, the resulting mixture containing the drug in a state of suspension. The results were as follows :—

Results of the 90-gr. Treatment (Beta-naphthol) on Forty Indians.

Case No.	Number of Hook-worms Expelled: First treatment	Second treatment	Third treatment
1	9	0	0
2	2	0	0
3	15	0	0
4	24	0	0
5	0	0	—
6	1	0	0
7	2	0	0
8	0	0	—
9	11	0	0

Case No.	Number of Hook-worms Expelled: First treatment	Second treatment	Third treatment
10	35	0	0
11	18	0	—
12	37	0	—
13	42	11	0
14	18	1	0
15	18	0	—
16	3	0	—
17	14	2	0
18	18	0	—
19	21	0	—
20	15	0	—
21	28	0	—
22	18	0	—
23	23	0	—
24	55	0	—
25	53	0	—
26	105	0	—
27	20	0	—
28	36	0	—
29	40	1	0
30	40	0	—
31	86	1	9
32	0	0	—
33	19	0	—
34	23	0	—
35	11	0	—
36	45	0	—
37	71	0	—
38	5	0	—
39	2	0	—
40	4	0	—
Totals	987	16	9
Proportion expelled	97·52	1·58	0·89 per cent.

The 90-gr. thymol treatment causes very serious constitutional disturbance. Stimulation of the nerve centres is at first evident, the individual is at first excited and talkative, the pulse and respiratory rates are quickened. Subsequently dizziness and drowsiness are complained of, the pulse becomes quick and compressible and if the patient is not kept in a recumbent position some syncope may be exhibited. As a rule a person taking thymol is at first somewhat talkative and afterwards drowsy and somnolent, in a certain proportion of cases alarming degrees of excitement or of syncope may be seen. The urine was examined in all these cases, before, during and after the administration of the drug. In two cases large traces of albumen were present during medication, but this had completely disappeared twenty-four hours later. From the table it will be seen that practically all the parasites were removed with one course of treatment, but the numbers present were very small.

The number of cases dealt with is too small to enable one to lay down more than generalizations; it may be pointed out, however, that the Porto Rico Commission[1] found that 76·8 per cent. of the total number of parasites present were expelled with one course of thymol treatment, their maximum dose of the drug being 4 grm. or 61·7 gr. The 90-gr. thymol treatment is certainly more effective than this and a clearance of probably over 90 per cent. of the total number present is made with one treatment. From what I have seen of the drug when administered in these large doses, the most careful supervision of the patient is absolutely necessary and it could not be given in out-door or dispensary practice.

Eucalyptus proved to be a very unsatisfactory drug. The first treatment expelled only 74 per cent. of the parasites present, and although the total number present was small, half the cases required three courses of treatment and two of them four courses before all the hook-worms came away. The treatments were carried out every fourth day, all the patients suffered from nausea and vomiting; some of them, after the first treatment, commenced retching before the medicine was actually taken and it was most difficult to persuade the patients to go on with the treatment. Dizziness, syncope and somnolence were all exhibited in a more or less marked degree and it was evident that medication of large numbers by this method would be quite impossible.

The pelletierine tannate proved easy to administer and the large dose of 12 gr. was given without producing any toxic symptoms. The drug proved to be quite harmless to the hook-worm, the parasite being afterwards proved to be present in each individual.

The 60-gr. beta-naphthol treatment gave fairly good results. The toxic symptoms were mild, there was no exhilaration, the circulation was a little depressed, the pulse a little quickened and the extremities were cold. The patients wrapped themselves closely in their blankets and lay about. These symptoms passed off very quickly and the meal, given to them about two hours after the purgative, was keenly enjoyed. The first treatment expelled 86 per cent. of the parasites present and the second 14 per cent.

Izal was given to thirteen men, the total amount given to each was 4 drachms divided into three doses of 80 ♏ each. The patients complained of burning sensations in the stomach, there was some nausea but no vomiting and on the whole the medicine was well taken and the toxic symptoms extremely slight. Slight albuminuria was present in four cases, but this had disappeared on the following day. As the number of parasites was small, the stools of the last nine cases were collected for a period of forty-eight hours instead of twenty-four hours, but no parasites were found in the second period. The treatments were given at intervals of a week; the first resulted in removing 90 per cent. of the parasites, the remaining 10 per cent. were all removed by the second course of treatment. The drug is certainly more effective than eucalyptus but is probably less effective than either thymol or beta-naphthol.

The 90-gr. beta-naphthol treatment was at first carried out on ten men, but as further evidence of its effect was required the observations were extended by placing another thirty men under treatment. One or two of the men complained of slight nausea and a sensation of warmth in the epigastrium. There was no excitement or exhilaration. The pulse was small and quick and the extremities somewhat cold, the men wrapped themselves in their blankets and lay about. None of them complained of any faintness, but this is a symptom that is occasionally seen, though

[1] Anæmia in Porto Rico, Preliminary Report, 1905.

not in such degree as to cause alarm. The urine was not in all cases tested for albumin, but slight traces of this were found in several of the cases and it was absent again on the following day.

The first treatment removed 97·52 per cent. of the parasites present.

The second treatment removed 1·58 per cent. of the parasites present.

The third treatment removed 0·89 per cent. of the parasites present.

One 90-gr. treatment removes practically all the hook-worms harboured by the average newly arrived Indian and the present regulations for the removal of these parasites from our immigrants on their arrival is based upon this principle.

The effect of the various drugs employed may be best demonstrated by a table showing the percentage of parasites expelled by the first and subsequent treatments.

	Proportion of Hook-worms Expelled				
	First treatment	Second treatment	Third treatment	Fourth treatment	Fifth treatment
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Thymol (90 gr.)	97·87	2·13	0·0	—	—
Eucalyptus (2·5 gr.)	74·2	7·2	17 0	1·13	0·37
Izal (4 drm.)	90·0	10·0	0·0	—	—
Beta-naphthol (60 gr.)	86·0	14·0	0 0	—	—
Beta-naphthol (90 gr.)	97·32	1·58	0·89	—	—
Pelletierine tannate (12 gr)	0 0	0·0	—	—	—

Thymol and beta-naphthol gave much better results than any of the other drugs. There is probably very little difference between them in anthelmintic power, but the constitutional disturbance caused by thymol is so great that it cannot, in these doses, be used on a large scale. Beta-naphthol causes comparatively little disturbance, is effective, easily administered and costs much less than thymol.

The Porto Rico Commission investigated and compared the effect of these drugs, their results were:—

First treatment—
Thymol .. .. 76·85 per cent. of parasites expelled.
Maximum dose, 60 gr.
Beta-naphthol .. 72·24 ,, ,, ,,
Maximum dose, 45 gr.

If they had given the beta-naphthol in larger doses, the result would probably have been proportionately better, as all observers find that the effect depends entirely upon the amount given. The following table shows this point very well.

Porto Rico treatment—
Beta-naphthol, 45 gr., expels 72·24 % of total number of parasites.
Natal treatment—
Beta-naphthol, 60 ,, ,, 86·0 ,, ,,
,, 90 ,, ,, 97·32 ,, ,,

Izal in the large quantity of 4 drachms gave surprisingly good results, a larger number of observations, however, would have to be made before its suitability for treatment on a large scale could be determined; it was much better taken than eucalyptus and gave better results. From what was seen of the results of treatment with Phillips' eucalyptus formula it is surprising that it has ever been extensively used. It was extremely difficult to get the Indians to take it and these people are most docile in matters of this sort; some of them suffered severely from sickness and syncope, and as an anthelmintic the results were not particularly good.

The failure of pelletierine is an illustration of the value of empiricism uncontrolled by exact methods of observation.

The men under observation were all newly arrived Indian immigrants, some were shipped from Calcutta and were recruited from United and Central Provinces and the Bengal Presidency; the others sailing from Madras were recruited from all parts of the Madras Presidency. They were not selected in any way but were representative of the type of labourer we have been importing into Natal for many years. They were all in good health and had been subjected to repeated medical examinations in India and in Natal. It is not claimed that drugs could be given in these large doses in cases of hook-worm disease where there was marked anæmia and debility, and with more or less impairment of the vital powers. We have, however, developed a system of purgation applicable to healthy labourers, which is capable of adoption by any of the Colonies importing Indian labour where it is desired to limit the introduction of hook-worms as a supplementary measure only to compulsory sanitary improvements on estates. With careful organization we have found it easy to treat 200 to 300 individuals in one morning, and the proportion of cases exhibiting toxic symptoms, in which treatment has to be interrupted, is extremely small. Since the inception of this system we have given about 22,000 treatments, one fatality only[1] has been reported, viz., a child 2 years of age who died forty-eight hours after taking 5 gr. of the drug. Where the kidneys are healthy beta-naphthol is evidently tolerated in very large doses.

Some other interesting facts were brought to light in the course of these investigations. Of the eighty-three men under observation, seventy-seven were hook-worm carriers, or 92·7 per cent. of the total number. The large majority of these seventy-seven had less than twenty parasites, the average number being 22·2. An analysis of the figures shows that—

52 men, or 67·5 per cent., had less than 20 hook-worms.
16 ,, or 20·7 ,, ,, between 20 and 50 hook-worms.
9 ,, or 11·7 ,, ,, more than 50 parasites.

The largest number recovered from one individual was 114. These figures merely corroborate the work of all the Indian investigators on the subject of hook-worm infection. The general view that is taken on the subject in India may be summarized by saying (*a*) that hook-worm infection is practically universal

[1] "Hook-worm Infection and Disease in Natal," *Transvaal Medical Journal*, June, 1910.

throughout India, and (*b*) that the individual infections are, as a rule, light and that the number of parasites present is generally too small to be the cause of any disease in the host.

Both species of hook-worm common to man are present in India. In coolies coming from Southern India the large majority of the parasites are of the *Necator americanus* species, and when the *Ankylostoma duodenale* is found it is usually present in small numbers as a mixed infection combined with necators. With coolies shipped from Calcutta, recruited from Bengal, United and Central Provinces, the infection is almost always with *Ankylostoma duodenale*, but the necators are frequently present in very small numbers. It would certainly appear that the species necator had a definite geographical distribution in Southern India and the ankylostome similarly in Northern India. The question is one for further inquiry, as any information bearing upon the life-requirements of these parasites might greatly assist in our efforts to limit their spread. The fact that some necators are found in Northern India and some ankylostomes in Southern India may possibly be explained by the increased provision of railway facilities and the migrations of population from one place to another, and it may be quite a modern development.

THE PREVALENCE OF FILARIAL EMBRYOS IN THE BLOOD OF THE LAGOS NATIVES.

By A. Connal, M.D.Glas., D.T.M. & H.Camb.
Gold Coast, West Africa.

This paper deals with the results of a search for filarial embryos in the blood of 700 natives in Lagos, West Africa.

The investigations were carried out with a view to ascertaining the prevalence of infection, and the effects of the parasites in the circulation.

The persons examined include two classes, those apparently in good health, the prison occupants, and those suffering from disease, the hospital patients.

The examinations were made as a routine procedure in the hospital from November 12, 1910, until April 15, 1911. The prison population was examined between November 15 and December 15, 1910.

The number consists of 444 patients and 256 prisoners.

The blood was taken twice in the twenty-four hours, the actual time being, as near as possible, 11 a.m. and 11 p.m.

Films were examined in the fresh state as well as in thick, dehæmoglobinized, stained preparations.

Ehrlich's hæmatoxylin applied for five minutes without the aid of heat was found to bring out the details of the embryos satisfactorily, after the usual fixation of the smear in equal parts of absolute alcohol and ether.

All the hospital patients were examined both day and night, except five, whose blood was taken only in the day-time, and one in which an examination was made only during the night. Samples of blood were collected during the night only in 112 prisoners, and the remaining 144 were examined both day and night.

The hospital patients being more numerous than the prisoners, offer more reliable information.

Table I shows the number of patients examined and the number and percentage of infected persons, arranged in monthly columns. Chart I shows the percentage of infection graphically.

The months of February and March give the highest percentages, while November and April, with a small number of examinations, give the smallest percentages.

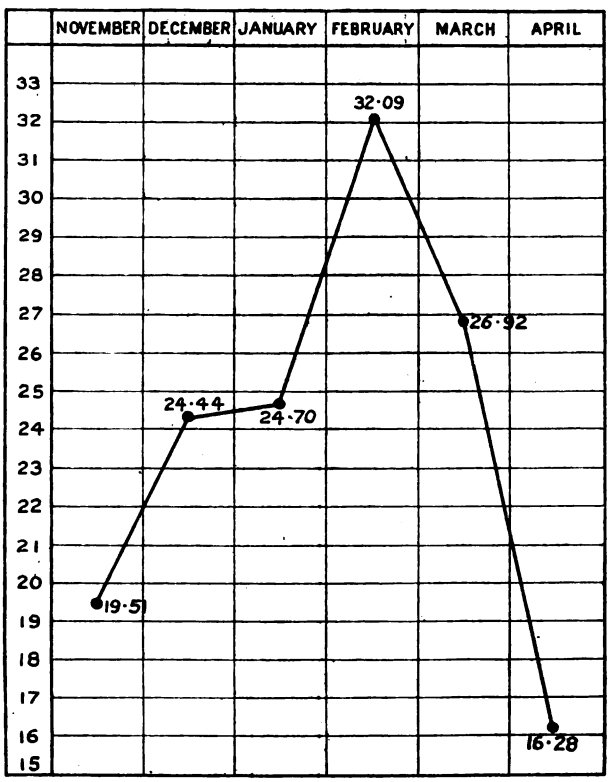

Chart I.—Showing Percentage of Infection in Six Months.

The period covered by the investigations is the driest part of the year, the rains having practically ceased in November, and the tornado season beginning in April, mosquitoes are correspondingly less numerous during those six months.

The percentage of infected persons is 25.22. Infections by one species of embryo alone account for 21.62 per cent., and mixed infections are 3.60 per cent.

The percentage of cases in which only one species was observed, calculated on the total number of infections is 85.71 per cent., and mixed infections equal 14.28 per cent. Embryos of *F. loa* were found in sixty-three cases, occurring both day and

TABLE I.—SHOWING DISTRIBUTION OF FILARIAL EMBRYOS IN THE SEVERAL MONTHS.

	Nov.	Dec.	Jan.	Feb.	March	April	Total
Embryos of *F. loa* during day only	5	7	3	7	4	—	26
,, ,, ,, day and night	—	4	6	8	7	1	26
,, ,, ,, night only	—	1	—	—	—	—	1
,, *F. bancrofti* during night only	—	3	5	6	3	1	18
,, ,, ,, day and night	—	1	—	—	1	2	4
,, ,, ,, day only	1	—	—	—	—	—	1
,, *F. perstans* ,, ,, ...	—	4	1	2	2	—	9
,, ,, ,, day and night	—	1	3	—	2	1	7
,, ,, ,, night only	—	—	1	1	1	1	4
,, *F. loa*, day only ; *F. perstans*, day only	1	1	—	—	—	—	2
,, ,, day and night ,, night only	1	—	—	—	—	—	1
,, ,, ,, ,, day and night ...	—	—	1	1	3	—	5
,, ,, day only ; *F. bancrofti*, night only	—	—	—	—	2	—	2
,, *F. bancrofti*, night only ; *F. perstans*, day and night	—	—	1	—	1	1	3
,, ,, ,, ,, night only ...	—	—	—	1	1	—	2
,, ,, day and night ,, ,, ...	—	—	—	—	1	—	1
Monthly total infected	8	22	21	26	28	7	112
Monthly total examined	41	90	85	81	104	43	444
Percentage infected	19.51	24.44	24.70	32.09	26.92	16.28	25.22

TABLE II.—SHOWING PARTICULARS OF THE EXAMINATION OF THE HOSPITAL PATIENTS AND THE PRISONERS.

Species of embryo	Number of persons infected		Total of persons infected	
	Hosp.	Pris.	Hosp.	Pris.
F. loa day	26	20	53	25
,, both	26	4		
,, night	1	1		
F. bancrofti night	18	19	23	20
,, both	4	1		
,, day	1			
F. perstans day	9	2	20	8
,, both	8	—		
,, night	3	6		
F. loa both, *F. perstans* both ...	5		8	7
,, ,, night ...	1			
,, day ,, both ...	—	2		
,, ,, ,, day ...	2	4		
,, night ,, night ...	—	1		
,, day, *F. bancrofti* both ...	—	1	2	2
,, ,, night ...	2	1		
F. bancrofti night, *F. perstans* day	—	2	6	6
,, ,, ,, night	2	4		
,, ,, ,, both	3			
,, both, ,, night	1			
	112	68	112	68

Total of *F. loa* infections		Percentage of *F. loa* infections on examinations		Ditto on total infections		Ditto on single infections		Ditto on mixed infections	
Hosp.	Pris.	Hosp.	Pris.	Hosp.	Pris.	Hosp.	Pris.	Hosp.	Pris.
63	34	14.12	13.27	56.25	50	55.20	47.17	62.5	60

Total of *F. bancrofti* infections		Percentage of *F. bancrofti* infections on examinations		Ditto on total infections		Ditto on single infections		Ditto on mixed infections	
Hosp.	Pris.	Hosp.	Pris.	Hosp.	Pris.	Hosp.	Pris.	Hosp.	Pris.
31	28	6·98	10.93	27.67	41.17	23.9	37.73	50	53.33

Total of *F. perstans* infections		Percentage of *F. perstans* infections on examinations		Ditto on total infections		Ditto on single infections		Ditto on mixed infections	
Hosp.	Pris.	Hosp.	Pris.	Hosp.	Pris.	Hosp.	Pris.	Hosp.	Pris.
34	21	7.65	8.20	30.35	30.88	20.83	15.09	87.2	86.66

Hospital patients examined	444
Prisoners ,, ...	256
Hospital patients infected	112
Prisoners ,, ...	68
Percentage infection, hospital patients ...	25.22
,, ,, prisoners	26.45

night in thirty-two, and only during the day in thirty. There is one case in which they were not observed during the day, but were seen at night.

There are ten instances of the co-existence of *loa* embryos with those of other species, *perstans* embryos being associated in eight, and *bancrofti* embryos in two cases.

There are thirty-one records of the occurrence of embryos of *F. bancrofti*, the infection being pure in twenty-three and mixed in eight cases. The mixed cases are made up of six in which *perstans* embryos were seen, and two in which *loa* embryos were associated.

Bancrofti embryos were found during the night only in twenty-five cases, both day and night in five, and only during the day in one case.

The embryos of *F. perstans* are noted as having occurred in thirty-four cases, the infection being unmixed in twenty. There are fourteen instances generally on the thigh, buttock, or leg. It is possible that the origin of the abscess in some of the cases was an adult filaria which had died in the tissues, a pyogenic infection following. The contents of most of the abscesses were examined, but no signs of filarial tissues were seen.

It is certainly striking that nine out of the ten cases showed embryos of *F. loa* in the blood. They were present as an unmixed infection in seven, associated with *perstans* in one and with *bancrofti* in another. Embryos of *F. perstans* were found alone in the tenth case.

The cases of ulcer number eight. These ulcers may have originated from the same cause as the abscesses, but as the bulk of out-door hospital work consists in attending to patients suffering from ulcer, very few of whom are infected with filaria, such origin is probably unusual. Embryos of *F. loa* alone were seen in three of the cases, *perstans* alone

TABLE III.—SHOWING SPECIES OF EMBRYO IN VARIOUS DISEASES.

	Abscess	Hernia	Wound	*Ulcer*	*Fever*	Diarrhœa	Gonorrhœa	*Hydrocele*	Cardiac	*Synovitis*	Cellulitis	Adenitis	*Rheumatism*	Bronchitis	*Malingering*	Nephritis	Conjunctivitis	Guinea worm	Tumour	Gastritis	Fracture	Phimosis	*Calabar Swelling*	Hepatitis	Constipation	Periostitis	Tetanus	Leuconata	Corneal ulcer	Schistosomiasis	Septicæmia	Pneumonia	Jiggers	Trypanosomiasis	*Elephantiasis*	Phthisis	
F. loa, day	4	3	2	1	1	—	2	—	1	1	2	1	1	—	—	1	—	—	—	1	1	—	2	—	—	—	1	—	—	—	—	—	1	—	—	—	26
,, both	3	1	3	2	2	—	1	—	2	1	—	1	—	1	2	1	1	1	1	—	—	—	—	—	—	—	—	1	1	—	1	—	—	—	—	—	26
,, night	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
F. bancrofti, night	—	3	—	—	3	—	1	3	—	1	—	—	—	1	—	—	—	1	1	—	1	1	—	—	—	—	—	—	—	1	—	1	—	—	—	—	18
,, both	—	—	1	1	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4
,, day	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1
F. perstans, day	1	—	1	—	—	1	1	—	—	—	—	1	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	1	9
,, both	—	—	1	2	1	1	—	2	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8
,, night	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	3
F. loa, day; *F. perstans*, day	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
,, both ,, both	1	1	—	—	—	1	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5
,, ,, ,, night	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
,, day; *F. bancrofti* ,, ...	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
F. bancrofti, night; *F. perstans*, both	—	1	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
,, ,, ,, night	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
,, both ,, ,,	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
	10	9	8	8	8	6	6	5	4	4	3	3	3	3	3	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	112

of its co-existence with other embryos, the species being *loa* in eight, and *bancrofti* in six.

The *perstans* embryos were found both day and night in fifteen patients, during the day only in eleven, and during the night only in eight.

The various percentages are to be found in Table II, where they are placed alongside of the results obtained from examination of the prisoners.

Table III shows the diseases from which the patients suffered and the species of embryo found. The list includes thirty-six diagnoses, twenty-six of which are fairly obviously unconnected with the presence of filarial parasites.

The remaining ten diagnoses are abscess, ulcer, fever, hydrocele, adenitis, rheumatism, synovitis, malingering, calabar swellings, and elephantiasis.

There are ten cases of abscess. The site was in two, and *bancrofti* alone in one. The remaining two cases showed *bancrofti* and *perstans* embryos together.

The eight cases of fever are interesting. A careful blood examination was made at intervals in each, without detecting parasites other than the filarial embryos. The duration of the febrile state was short in most of the cases, seldom longer than a week, and in no case was the chart suggestive of a malarial infection. Quinine had no apparent effect on the course of the temperature. It is possible that the fever was due to the presence of the filariæ, in the absence of any other obvious cause. An analysis of the cases shows that *loa* embryos were present as an unmixed infection in three, *bancrofti* embryos unmixed in four, and *perstans* alone in one.

Filarial embryos are recorded in five cases of hydrocele, the species being *bancrofti* in three and *perstans* in two.

Four cases of synovitis exhibited filarial embryos in the blood. Two of these cases were attributed to injury and no cause was assigned in the other two. *Bancrofti* embryos occurred alone in two cases and *loa* embryos alone in the other two.

The three cases of adenitis were probably due to the presence of filariæ, the species being *loa* in two and *perstans* in one.

The three cases of "rheumatism," and the three instances of "malingering," are grouped together, the complaint in all of them being of vague pains. No swelling was observed, pain more or less localized, and tenderness which could generally be elicited in any situation, with an absence of fever, being the other conditions found. Embryos of *F. loa* were seen in three of the patients, and *perstans* in one, as unmixed infections. *Loa* and *perstans* were associated in the fifth case, while *bancrofti* and *perstans* embryos co-existed in the sixth.

Two cases of so-called calabar swelling were examined and *loa* embryos were found alone in both. There was a non-fluctuant swelling in front of the left tibia, and on the left side of the chest in one case, and there was a similar swelling on the dorsum of both hands and of the left foot in the other case. The pain complained of was numbing, there was faint pitting on pressure and slight tenderness existed. The heart appeared to be healthy and the urine to be normal in both cases, and the condition passed off in about a week. Filarial embryos were found in one case of elephantiasis, the species being *perstans*.

A careful inquiry was made in all the cases, which showed embryos of *F. loa*. Each patient was questioned as to the occurrence of swellings or pain and as to the movement of worms across the conjunctivæ or elsewhere. The answers were uniformly in the negative.

It is to be noted that the diagnosis in all the cases was made by the medical officer, uninfluenced by the findings of the observer, who frequently did not see the diagnosis until after the discharge of the patient.

The question of sex appears to have an important bearing. Forty-three female patients were examined and only one was found to harbour filariæ. The case was one of trypanosomiasis and the species of filaria was *perstans*.

The influence of age is interesting. The bulk of the cases occurred between the ages of 25 and 45 years. This is well seen in Chart II.

There are grounds for believing that certain districts are more heavily infected than others. This probably depends on the extent and the suitability of the breeding-grounds for particular mosquitoes. Exact data were not obtained, but it was observed in a general way that natives from the Eastern and Central Provinces more frequently showed filarial embryos than the natives of the Western Province in Southern Nigeria.

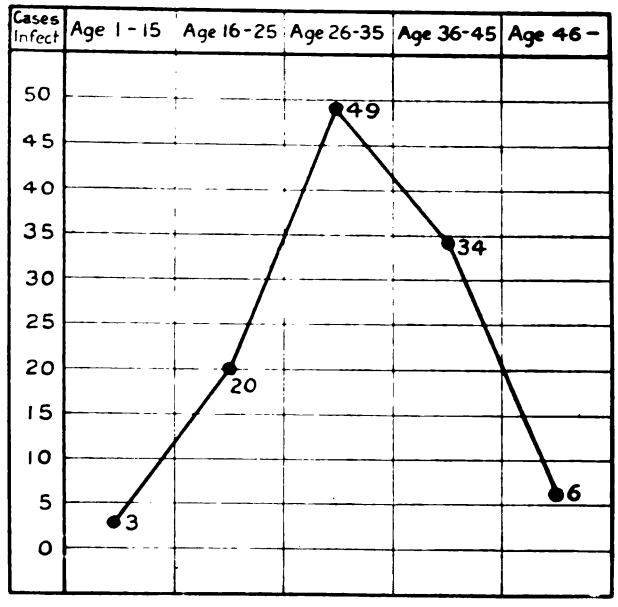

CHART II.—SHOWING APPROXIMATE PERCENTAGE OF INFECTED PERSONS AT THE DIFFERENT AGE-PERIODS.

The degree of Eosinophilia was found to vary within fairly wide limits. The lowest observed was 0.66 per cent., and the highest 19.2 per cent., in twenty-seven cases, in which a differential count was made of 500 leucocytes.

Table IV gives the details of these cases. Probably intestinal worms account for the great variations.

TABLE IV.—SHOWING DEGREE OF EOSINOPHILIA IN CERTAIN CASES.

Disease	Eosinophils	Embryos of
	Per cent.	
Beri-beri	5	*F. perstans*
,, ...	1.6	*F. loa* and *F. perstans*
Trypanosomiasis ...	10.66	*F. perstans*
,, ...	2.66	,,
,, ...	6.66	,,
,, ...	12	,,
Ulcer	7.8	,,
Nil	7.4	*F. loa*
,, ...	8.8	,,
,, ...	19.2	,,
,, ...	14.8	,,
,, ...	12.8	,,
,, ...	4.2	*F. bancrofti*
,, ...	7.8	,,
,, ...	12.4	,,
,, ...	7.2	,,
,, ...	13.2	*F. perstans*
,, ...	16.4	,,
,, ...	11	,,
,, ...	13.6	,,
,, ...	12	*F. bancrofti* and *F. perstans*
,, ...	16.4	,, ,,
,, ...	8.4	,, ,,
,, ...	16.6	,, ,,
,, ...	7.6	*F. loa* and *F. perstans*
,, ...	14.4	,, ,,
,, ...	17.2	,, ,,

Four cases out of the 112 infected patients came to *post mortem*. Adult filariæ were only found in one of these. The case was one of advanced cardiac valvular disease. The patient was admitted late at night in a moribund state. He died within a few hours. A blood smear showed enormous numbers of *loa* embryos, and a few *perstans* embryos during life. At the *post-mortem* examination, twenty-one adult *F. loa* were recovered from the tissues in the scrotum.

Embryos may be found in the blood at certain times on certain days, and to be absent at the same hour on other days. This was noted in four cases, the species of embryo being *perstans* in three cases and *loa* in the fourth. Embryos of *F. perstans* in one of these cases were seen in a thin blood-smear, but were not again seen, even in thick dehæmoglobinized drops, for a fortnight.

An analysis of the results obtained from the prisoners shows that the percentage of infection was 26.45. Infections by one species alone equalled 20.62 per cent., and mixed infections were 5.83 per cent.

The pure infections, calculated on the number of infected persons, yielded a percentage of 77.94, and the mixed infections gave 22.05 per cent.

Embryos of *F. loa* were found in thirty-four cases. They were unmixed with other species in twenty-five, and associated with *perstans* in seven and with *bancrofti* in two. They were found during the day only in twenty-eight, both day and night in four, and only at night in two cases.

Embryos of *F. bancrofti* occurred in twenty-eight cases, the infection being pure in twenty and mixed in eight. These embryos were seen at night only in twenty-six, and both day and night in two cases. *Perstans* embryos were associated in six instances and *loa* embryos in two.

Embryos of *F. perstans* were observed in twenty-one cases, and in thirteen of these other species of embryos co-existed, so that only eight cases were pure infections.

Loa embryos were associated in seven and *bancrofti* embryos in six cases.

The actual numbers and percentages are to be seen in Table II, where they are compared with the results obtained from the hospital patients.

Thirteen female prisoners were examined, and *loa* embryos were found in two.

Conclusions.

Embryos of *F. loa* are much more commonly found than those of the other species.

Embryos of *F. bancrofti* and of *F. perstans* are about equal in frequency.

Pure infections are of more frequent occurrence than mixed infections.

Embryos of *F. perstans* are more often seen in association with either *loa* or *bancrofti* embryos than are the latter two with each other.

The commonest mixed infection is of *loa* and *perstans* embryos.

Embryos of *F. loa* are more often seen during the night than are *bancrofti* embryos seen during the day.

No other species of embryo was observed beyond the three which are described.

Filarial infection is most common in the period of active adult life, between the ages of 25 and 45 years.

Thanks are due to the Hon. Dr. F. G. Hopkins, Principal Medical Officer of the Gold Coast, for permission to publish these notes, and to Drs. Gray, Craig, Beattie, and Neale for the supply of material.

AN IMPORTED INDIAN CASE OF ORIENTAL SORE IN WEST AFRICA.

By Adam Hutton, M.B., Ch.B.Aberd., D.T.M. & H.Cantab.

West African Medical Staff, Lagos; Late Demonstrator London School of Tropical Medicine.

The following notes of an oriental sore imported into West Africa are of interest:—

Lieutenant H. P. F. served for two years and four months in India. He was stationed at Quetta for one year and ten months, and at Poona for the remaining six months. Five months after he went to England on leave, a small, raised indurated patch appeared on his left wrist. It was oval in shape about ¾ in. long and ½ in. wide. It was painless and gave no trouble and has remained as it began, except that a few slight scales have appeared on the surface from time to time. He had had it two months when he came to Lagos, where he has now been one month. He consulted Dr. T. L. Craig, Resident Medical Officer, Lagos Hospital, with whom I saw it. A small piece was removed for examination at the Research Institute, and at the same time two smears were made from the cut surface. These, on being stained by Giemsa's method, showed large numbers of the parasite *Leishmania tropica*. "Scinde sore" is very common at Quetta, but the patient never heard of it at Poona. Thus the incubation period must have been about eleven months. Leishmania sores have of course already been reported in indigenous natives of West Africa and the disease is probably more common than is generally supposed. The interest in the present case lies in the point that the patient might have acted as a focus of infection to other people, but the fact of his sore being non-ulcerated renders this of course highly improbable.

THE SUPERFICIAL LYMPH-NODES AS A SOURCE OF LEISHMANIA FOR DIAGNOSIS IN CASES OF KALA-AZAR.

By Samuel Cochran, M.D.

Hope Hospital, Hwaiyuan, Anhwei, China.

The means that have hitherto been in use to obtain Leishmania for the positive diagnosis of kala-azar are open to serious objections. The examination of smears from the circulating blood is

out of the question as a routine measure, as the parasites are not always present in undoubted cases, or if present are so few in number that the search is tedious and time-consuming. A negative result is therefore not conclusive, and even when the parasite is discovered, an almost prohibitive amount of time has been occupied.

Many observers have been accustomed to make punctures of the viscera, either the spleen or the liver. A number of deaths have been reported as the result of splenic puncture, even when made with every precaution, and there is a growing feeling that its routine use is not justifiable. Puncture of the liver is said to be less dangerous; but it is also less useful, as long search sometimes fails to reveal the parasite. Indeed, the same objection lies in less degree against splenic puncture, as several hours are sometimes necessary for the search.

We have in this region a large number of sufferers from kala-azar, and in the effort to confirm the diagnosis by the microscope, in December, 1910, we lighted on a method which promises to be more useful and less objectionable than those now commonly used. After a vain search by blood-smears, after one case of failure to find the parasite in smears from a liver-puncture, after taking several hours in searching smears from a splenic puncture before finding Leishmania, and after a fruitless search of smears from Spanish-fly blisters and croton-oil pustules in two or three different cases, we found the parasite in large numbers in smears made from the cut surface of a post-cervical lymph-node, removed under local anæsthesia.

Our observations were interrupted for several months, and we have had, since the first case, opportunity to examine smears from the glands of only six others, but have found the parasite with ease in all of them. The longest search was only twenty minutes, and in the other six cases it was not over five minutes; some of the slides contain the parasite in large numbers, every field showing a number.

In two cases in which smears from the excised nodes showed numerous parasites, we failed to find them in smears obtained from gland-punctures made with a large serum syringe.

In the cases thus far observed, the enlargement of the glands is about similar to that noticed in syphilitic subjects, and excision under local anæsthesia is very easy, a very small incision being sufficient. The lymphatic chains of the groin are also eligible for this purpose, and their excision is about as easy as that of the post-cervicals.

In the first case examined by this method we had already punctured the spleen and only found the parasite after a long search, as above mentioned, but found them readily and promptly in the lymph-nodes. It is therefore possible that certain cases, in which the result of visceral punctures was negative, might show the Leishman-Donovan body in gland-smears.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JANUARY 1, 1912.

TO ESTIMATE AND RECORD THE DIMENSIONS OF THE LIVER—THE USE OF THE TUNING-FORK.

THE exact dimensions of the liver is an important element in diagnosis to every medical practitioner, and more especially so to those engaged in practice in the Tropics. Percussion and palpation are the time-honoured methods universally employed, but every one who has much experience in hepatic ailments knows how unsatisfactory these methods are in determining the exact or even the approximately exact outlines of a liver.

A rigid rectus muscle will interfere with palpation in all cases in which the liver is tender, and one has to rely on percussion alone as a means of diagnosis; a method, however, which is often faulty. Of late the stethoscope has been employed in conjunction with (*a*) the sharp impact of the "finger-flick method." The middle finger-tip is placed on the front of the terminal phalanx of the thumb, then pressed firmly, and when freed sharply is made to impinge against the skin of the abdomen or lower part of the chest wall over the region of the liver. When the impact is made over the area of the liver the sound is conducted sharply along the stethoscope; but when made beyond the outline of the liver the impact is faint or unheard.

In this manner the outline of the liver can be determined. (*b*) "Light scratchings" of the finger-tip over the liver area when the stethoscope is applied give very similar indications of sound to those mentioned under method (*a*), a good idea of the size of the organ. (*c*) "The tuning-fork" method is the plan favoured by the writer to determine the outline of the liver. With the stethoscope applied over the liver area and a tuning-fork, made to reverberate loudly, pressed with moderate firmness over and around the liver margins, an exact outline of the organ can be mapped out. The tuning-fork should be applied, when the thoracic dullness is being sought for, over the intercostal spaces, as if applied over the ribs the sound is conducted from the bone in too pronounced a degree. The stethoscope may be moved along the lower and upper edges of the liver as the tuning-fork is successively applied. By the tuning-fork method the area of the hepatic dullness is more exactly defined than by any other method, and the writer prefers it to any other known method, and invariably employs it when exact measurements are demanded.

To keep records of the size of the liver, the writer adopts the following plan: On the skin, along the lower ribs, a brush dipped in a solution of Indian ink is drawn; similar lines are also drawn along the lower border of the ensiform cartilage, and the intercostal margins on either side, the umbilicus, and the nipples are similarly marked. The solution is allowed to dry. The liver dullness is then tested by the stethoscope and tuning-fork (a percussion) method and the limits drawn on the skin by a brush dipped in a solution of vermilion. [It is not necessary to do more than moisten the end of an Indian-ink tablet for the one, and a slop of vermilion paint will answer for the other.] The vermilion markings are then allowed to dry on the skin. A piece of gauze or cheese-cloth is then made to encircle the body, reaching from above the nipples to below the umbilicus. The gauze has to be pulled tightly and fixed by safety-pins. The markings on the skin being perceivable through the gauze, the black lines of the chest landmarks, and the vermilion line along the liver edges are drawn on the gauze. A couple of these copies should be taken, one to be retained by the doctor, and the other given to the patient, should he intend going elsewhere for change or treatment. In this way an exact full-sized outline of the size of the liver is kept for reference, and should the patient present himself to another doctor, say, at home, after a long voyage from the Tropics, the new medical adviser is in a position to judge whether any change has taken place in the size of the liver during the voyage. All that has to be done is to place the gauze cloth on the patient's chest or, better still, pin it round the body as indicated in the first instance. A full-sized representation of this sort is much more exact than is possible when relatively minute paper drawings are employed.

J. CANTLIE.

LONDON SCHOOL OF TROPICAL MEDICINE.

EXAMINATION RESULT (THIRTY-SEVENTH SESSION, OCTOBER TO DECEMBER, 1911).

*Captain W. D. Wright, I.M.S., M.B., Ch.B.Edin.
*C. F. Simpson, M.B., Ch.B.Aber.
B. A. Percival, M.B., B.C.Cantab. (Colonial Service).
W. Y. Turner, M.B., Ch.B.Glas.
E. J. Quirk, M.R.C.S., L.R.C.P. (Colonial Service).
J. W. Tomb, M.B., B.Ch., D.P.H.Dub.
J. W. Thomson, M.B., Ch.B.Glas. (Colonial Service).
R. Semple, M.B., Ch.B.Aber. (Colonial Service).
M. Salih, Degree in Arts, Amsterdam.
L. Sammy, M.B., Ch.B.Edin.
P. L. Craig, M.B., C.M., D.P.H.Glas.
Miss L. E. Watney, M.B., B.S.Lond.
R. Willan, M.R.C.S., L.R.C.P. (Colonial Service).
W. B. A. Moore, L.R.C.P. and S.I. (Colonial Service).
E. J. Powell, M.B., B.Ch.Dub. (Colonial Service).
M. Graves, L.M.S.S.A. (Colonial Service).
W. Browne, M.R.C.P. and S.Edin. (Colonial Service).
S. Goodbrand, M.B., Ch.B.Aber. (Colonial Service).
W. A. Nicholson, M.B., B.Ch., B.A.O.Dub. (Colonial Service).
H. Ostrom, M.D.(U.S.A.).
Miss M. Pantin, L.M.S.S.A.
R. Mugliston, M.R.C.S., L.R.C.P. (Colonial Service).
D. C. Robertson, M.B., Ch.B.Aber.
G. Girgis El-daba, D.M. and S. (Cairo), M.R.C.S., L.R.C.P.
J. G. Morgan, M.R.C.S., L.R.C.P. (Colonial Service).
E. Ward, M.B., B.Ch.Belfast (Colonial Service).
C. H. Crooks, M.D.Kansas.
N. Mahrus, D.M.S.Egypt, L.R.C.P., M.R.C.S.

* With distinction.

Annotations.

TODD and WOLBACH, in a report entitled "The Diagnosis and Distribution of Human Trypanosomiasis in the Colony and Protectorate of the Gambia," conclude that:—

(1) Gland palpation and puncture is by far the most effectual of the procedures employed by them in the Gambia for the diagnosis of human trypanosomiasis.

(2) That at least 0.8 per cent. of the population of the Gambia are infected with trypanosomes.

(3) That measures designed to control human trypanosomiasis may be usefully instituted in the Gambia; they should include a continued examination of the whole population, the establishment of villages for the isolation, observation, and treatment of cases, and the appointment of a special staff for the administration and execution of these projects.

Yellow Fever.—In the *Yellow Fever Bulletin* for October, 1911, Dr. Melville-Davison, Medical Superintendent of the Booth Steamship Co., Ltd., contributes a very interesting and useful paper on "Mosquito Screening of Ships." He shows that this can be done by the use of a little common sense, and that the results so obtained are excellent. As far as the Booth Steamship Co. is concerned, the method has passed its experimental stage, and has been well received by the ship's crews, and, with few exceptions, much appreciated. Bearing this in mind, Dr. Davison considers that the time has arrived when the antiquated fumigation regulations against yellow fever ought to be withdrawn, or at least amended to such an extent that ships efficiently screened on the lines he has laid down should be exempt from the regulations, which would be in force against ships not so protected. Could shipowners be assured that their cargoes and fittings would not be ruined by sulphur fumigation, and that their passengers would in future be subjected to no inconvenience and delay from quarantine (if there was no sickness on board), he feels sure that, not only on humanitarian, but also on commercial grounds, the practice of screening ships against mosquitos would become universal.

The Blood Changes in Bilharziasis.—Day, writing in the *Lancet* of November 11, 1911, on the blood changes found in bilharziasis, summarizes the results of his investigations as follows:—

(1) Bilharziasis is characterized by a slight general leucocytosis due to a considerable increase in eosinophile and large mononuclear cells, the polynuclears being diminished.

(2) These changes are roughly proportional to the intensity of the disease provided the patient's general condition is good. The presence of grave anæmia, sepsis, or complicating disease obscures these changes, which reappear on improvement.

(3) Secondary anæmia is present to a moderate degree is most cases. Even when the red corpuscles show no reduction in numbers there is a loss of hæmoglobin (Kautsky).

(4) Profound anæmia may be caused by excessive loss of blood, prolonged suppuration, and especially chronic diarrhœa.

(5) Bilharziasis is the commonest worm infection in Egypt and is responsible for most cases of moderate anæmia in children.

(6) Ankylostomiasis incapacitates a larger proportion of the population than does bilharziasis.

(7) Ankylostomiasis is a much more frequent cause of severe anæmia than is bilharziasis. The term "Egyptian chlorosis," if used at all, should not be applied to the secondary anæmia produced by bilharziasis.

(8) The combination of both infections or the association with other diseases, such as cirrhosis, tends to aggravate the anæmia.

Reports.

THE SOCIETY OF TROPICAL MEDICINE AND HYGIENE.

AT a meeting of the Society of Tropical Medicine and Hygiene, held in London on December 15, 1911, a paper was read for Major Greig, I.M.S., on "Epidemic Dropsy in Calcutta." Major Greig, after a very careful inquiry into the whole subject, concluded:—

(1) That no *causa morbi* is to be found in the blood, œdematous fluid, excreta, &c., of epidemic dropsy cases.

(2) That the features of epidemic dropsy very closely resemble those of "ship beri-beri," as described by Axel Holst, and the cases present also symptoms of scorbutus. The number of red blood corpuscles is diminished during the course of the disease. The percentage of hæmoglobin is reduced. There is a relative increase of the lymphocytes (small mononuclears). The coagulation time is not appreciably increased.

(3) That the evidence points to epidemic dropsy being non-infectious.

(4) That there is evidence to show that epidemic dropsy is a nutritional disease, and is brought about by a "one-sided" dietary.

(5) That a community (Marwaris), living in the heart of the affected part of Calcutta, practically escaped epidemic dropsy. A careful analysis of their dietary, which differs materially from that of the Bengalis, shows that it is much richer in some important constituents—*e.g.*, phosphorus—than a rice dietary, and therefore, the quantity of these constituents taken by the Marwaris, among whom no fatal cases of epidemic dropsy have been recorded, is greater than that consumed by Bengalis, whose staple is rice, and who were severely affected by epidemic dropsy in the recent outbreak. The better class European community in Calcutta, living on a mixed dietary, and not consuming large quantities of rice continuously, have escaped.

(6) That the effect of the addition of meat to a dietary is very marked; among non-meat eaters, Hindu widows, who for religious reasons are prevented from consuming meat, the highest mortality from epidemic dropsy is shown, and the lowest mortality was amongst Hindo males and the percentage of meat-eaters among the latter is high. Hindu children have approximately the same percentage of meat-eaters amongst males and females, and the mortality from epidemic dropsy is approximately the same in the two sexes in children.

(7) That chemical analysis and histological examination show that by the process of "polishing," as carried out in the steam and other mills in Calcutta and elsewhere, constituents essential for nutrition are removed from the rice, and that the ata (wheat), which many Bengalis consume habitually, had been so finely sifted that it is deprived of these constituents to an even greater extent than rice.

(8) That the chemical examination of samples of the kind of rice habitually consumed by patients affected by epidemic dropsy shows that the samples had undergone a process of "polishing" by steam milling, and that important constituents had been removed to a considerable extent; that wheat consumed by patients affected by epidemic dropsy had undergone a considerable loss of phosphates in the preparation of ata.

(9) That pigeons show, when fed on "polished" rices, both boiled and unboiled, a progressive loss of weight with characteristic polyneuritis. Chemical analyses of these samples of rice show them to have a low phosphorus content.

(10) That control pigeons when fed on a mixture of wheat and pulses show no loss of weight, but rather a gain, and they have remained in good health for months. Chemical analysis of this food shows that it contains double the quantity of phosphorus contained in the sample of rice used for feeding the pigeons.

(11) That the two severe outbreaks of epidemic dropsy in Calcutta and Bengal, namely in 1877-78-79 and in 1907-08-09, have been correlated with a sustained high price of food grains during the period, and the cessation of these epidemics have synchronized with the fall in the price of food.

(12) That the sections of the community in Calcutta with a small fixed income, *i.e.*, clerks, petty traders, &c., show the highest morbidity from epidemic dropsy in Calcutta.

(13) That the epidemic is brought about in times of high price of food by the fact that the section of the population with a small fixed income is, on account of this rise, obliged to abandon the purchase of adequate supplementary articles of dietary, and, consequently, the diet becomes dangerously "one-sided"; with the drop in the price of food the income of this class admits of the obtaining of sufficient supplementary articles, and the diet ceases to be "one-sided," and the epidemic terminates.

Dr. Stannus next read a Paper on "Pellagra in Nyasaland." He pointed out that the disease occurred in these parts, and in fact was fairly common. On the subject of actual causation he did not speak, but recapitulated the following points relating to his cases:—

The staple diet was rice: maize was only rarely eaten; food was periodically examined, and though occasionally damaged grain might have been eaten, such could not often occur.

He was unhappily not in a position to give a detailed account of the insect fauna, possible carriers of protozoal infections, but he might mention that bugs, fleas, lice, tabanids, hæmatopota, stomoxys, mosquitoes and midges were all found in the neighbourhood. Simuliidæ of as yet undetermined species were found in Nyasaland, but he was unable to give their distribution. The nature of the country, however, on the lower mountain slopes with swiftly flowing streams would certainly favour their breeding.

Dr. Sandwith then followed; he gave a highly interesting account of the spread of pellagra in the Southern States of America, and also on account of what was being done there.

Drs. Sambon and Chalmers also spoke, both of these giving a brief account of the work of the Pellagra Field Commission on which they recently served. This terminated the proceedings.

AUSTRALIAN INSTITUTE OF TROPICAL MEDICINE. ABSTRACT OF REPORT FOR THE YEAR 1910.

By Austin Breinl, M.D.
Director of the Institute.

Dr. Breinl arrived in Townsville, Queensland, in January, 1910. His first duty was to organize a laboratory in a building erected for this purpose by the authorities. His difficulties in this direction were enhanced by his great difficulties experienced at the start in procuring suitable laboratory animals for experimental work in Townsville. All attempts to introduce wild rabbits from New South Wales proved a failure, as these animals did not become easily acclimatized, and of two large consignments only a few survived, and all efforts to breed rabbits have been a complete failure so far. Guinea-pigs are only procurable from the South in very limited numbers, so that experimental work on a larger scale is, under the present conditions, impossible. Tame mice cannot be had. Wild rats are obtainable in numbers, but most of them die in a comparatively short time in captivity. All trials to secure a larger supply of monkeys for experimental purposes have also failed up to now, only five animals in all being obtainable.

Prevalent Diseases in Queensland and Adjacent Islands.—Of the diseases of a more or less tropical character met with in Queensland and some of the islands to the north—Papua, Torres Straits Islands, Thursday Island, &c.—the more noticeable were as follows: sprue, dysentery (amœbic), filaria, malaria, beri-beri, ulceration, granuloma, yaws, leprosy, dengue fever, and "Barcoo rot" and sandworm diseases.

Of these ailments but few cases as a rule were met with, and malaria, dysentery, yaws, beri-beri and leprosy were most confined to islands to the north of Queensland.

Malaria, Dr. Brienl says, is for the most part of benign tertian type in Queensland, but in Papua, along the Fly River, crescents were found in the blood of persons from that region. This is a danger to Queensland, as the traffic between Papua and the north part of Queensland is fairly free and there is danger of malignant malaria reaching the mainland from the adjacent islands. The districts in which malaria is known to be endemic in Queensland are Innisfail, the Alice River (near Cooktown) and the Saxby River.

Leprosy was mostly seen in Thursday Island, and the report contains interesting photographs of several lepers and instructive details of their history.

Dysentery occurs at times in epidemic form in Papua and in Thursday Island. On the adjacent part of the Continent of Australia, dysentery is seldom

seen; and the only case recorded by Dr. Breinl was of the amœbic type.

Beri-beri cases were seen in the hospital in Thursday Island, of a mild type.

Filariasis plays an important pathological rôle in Queensland; and filarial lymphangitis, orchitis, hydrocele, varicose groin glands, elephantiasis, chyluria, and hæmato-chyluria are frequently met with.

Dengue fever, during 1910, was prevalent in Townsville, but no organism has been found in the blood or in secretions.

Ulcerative granuloma was studied in three cases, one a white man and two were aboriginals. No spirochætes were seen, but in one case bodies somewhat resembling Leishman-Donovan bodies, as described by Manson, were observed in large quantities.

The intestinal parasites proved to exist in Queensland and the islands mentioned above are: *Trichocephalus dispar*, *Oxyuris vermicularis*, *Ankylostoma duodenale*, *Strongyloides stercoralis*, and *Tænia saginata*. Of these, ankylostome infection is by far the most serious. The disease seems widely spread and as it infects school children and adults alike, it is of general significance and must be dealt with in a radical fashion if its extermination is decided upon. Dr. Breinl draws attention to a lesion which apparently precedes the ankylostoma infection, occurring especially in the Innisfail and Cairns districts. This lesion occurs in most cases on the inner side of the sole of the foot. At first a small inflammatory area appears, the skin becomes of a reddish colour. This inflammation soon begins to spread, but only in the form of spirals, the patient complaining of a creeping sensation in the affected area. After a shorter or longer period, this lesion disappears. Whether this peculiar lesion is to be compared to the ground itch in Assam, or to the craw-craw occurring on the West Coast of Africa, is a question which can only be decided by careful and painstaking work. As it is a popular belief in Cairns that the entrance of a sandworm under the skin gives rise to the described symptoms, experiments with the sandworms were conducted on monkeys, but have been negative.

Two other ailments are worthy of note: (1) Barcoo rot, a skin disease which occurs in the western parts of Queensland, is characterized by the formation of round, superficial ulcers with irregular outlines; very soon the ulcerated surface dries up and becomes covered by a dry scab, under which the ulceration heals up, only to break out again on some other part of the body, especially on the legs and arms. The bacteriological examination of this one case did not yield any results. Attempts to transmit the disease to the shaved skin of the back of a young rabbit were unsuccessful.

(2) "Sandworm" disease, a peculiar inflammation of the skin, occurring mostly on the inner side of the foot. The etiology and pathology of this complaint is at present not clearly understood. Dr. Breinl examined one case carefully, dissecting as far as possible into the flesh, but could not find anything which might give an explanation of this curious lesion.

Dr. Breinl's report is an important communication, especially concerning the geographical distribution of disease. It will also be of great importance in future years when Queensland is populated more extensively, when its over-seas commerce extends and its contact with tropical dwellers in the Great Archipelago between Australia and the Continent of Asia is more intimate. The advent of new ailments can be watched and their prevalence in the future tested according to the standard unfolded by Dr. Breinl in 1910. The Queensland authorities have done wisely, inasmuch as they have not waited until diseases of a tropical nature, with which they are threatened, had obtained a foothold in their midst, but instead they have taken the surest prophylaxis possible, namely, training medical men in tropical medicine so that should these diseases reach Australian shores they will be at once recognized and dealt with. Queensland, only a part of tropical Australia, is a large country, with a scanty white population. The study of the local diseases and their distribution is, therefore, different and in many ways more difficult than work in other tropical countries, where large native villages exist with a dense native population. Cases here occur only in scanty numbers, scattered over a large area. Sweeping epidemics are under the present conditions impossible, and any serious outbreak of sickness is more or less confined to one locality.

Queensland, moreover, is enjoying at present, on account of its insular isolation and scanty population, a comparative freedom from epidemic diseases: but this freedom is only temporary. If the country were more densely populated, and if railway communication were established between the northern coastal towns, Queensland would be laid open to the introduction and spread of various and deadly diseases, which occur in the near neighbourhood.

It is certain that most of these diseases under consideration may be kept out for a certain time by strict quarantine regulations; but as the incubation period in some is prolonged and the diagnosis, especially in the early stages, difficult, sometimes even impossible, it would prove a very difficult task to keep these diseases out for ever, even if there were appointed a highly scientifically trained staff of quarantine officers.

Anybody who has followed the development of tropical medicine since its foundation must have realized that the question of populating a tropical country with the white race has entered a new era. It is said to depend on sanitation only. Free the Tropics from disease, and the white race will thrive there just as well, if not better, than in a temperate climate.

In Queensland, under the present conditions, there should be no difficulty in eradicating at a comparatively small cost the existing diseases. It should not prove an impossible task to minimize the danger of introduction, and to prevent the spread of new diseases. But to accomplish this the quarantine officers would need to be possessed of a knowledge of all the epidemiological factors of the threatening diseases, which can only be obtained by an intimate

acquaintance with their clinical manifestations and their parasitological aspect, especially as some diseases are capable of being introduced by means of intermediary hosts, as ticks, mosquitoes, biting flies, &c. Only an exact knowledge with regard to local conditions and the presence of possible intermediary hosts will enable us to obtain this end.

Tropical Australia affords a unique opportunity for studying the adaptability of the white race to a tropical climate and conditions, not only of a white race surrounded by a host of native servants, but of a white race .doing hard manual labour under a tropical sun. Results obtained in this direction would be of great economic importance, not only for Australia but for the Tropics in general.

The study of this question would, furthermore, necessitate a careful and minute elucidation of the influence of the Tropics upon the physiological action and re-action of the human organism, and any results may give valuable clues with regard to the best mode of living and housing—in short, to the best mode of adapting the organism of human beings, born and bred for centuries in a temperate climate, to the Tropics.

As the working sphere of the Institute will not only comprise tropical Queensland, but also extend over whole tropical Australia and the neighbouring islands —as far as Papua—there is a possibility of an enormous amount of work, which, if carried through successfully, promises results which should be of great benefit for the development of the countries in question.

THE UNIVERSITY OF LIVERPOOL.

THE Diploma in Tropical Medicine has been awarded to the following:—

F. F. Brown, M.D , C.M.McGill.
D. J. Chand, L.R.C.P. and S.Edin., L.F.P.S.Glas.
J. M. Holmes, B.A., M.B., B.Ch., B.A.O.Dublin.
C. L. Ievers, L.R.C.P. and S.Edin., L.F.P.S.Glas.
E. K. Lomas, M.B., Ch.B.Manchester.
D. S. MacKnight, M.B., Ch.B.Edin..
J. V. Mascarenhas, M.B., C.M.Madras.
A. L. Oluwole, M.B., Ch.B.
J. A. Taylor, M.B., Ch.B.Edin..

THE SOCIETY OF TROPICAL MEDICINE AND HYGIENE.

AT a meeting of the Society of Tropical Medicine and Hygiene, held at 11, Chandos Street, Cavendish Square, London, W., on Friday, December 15, 1911, at 8.30 p.m., the following gentlemen were elected Fellows of the Society: Major S. Anderson, I.M.S.; Frederick F. Brown, M.D., Liverpool; William Browne, L.R.C.P. and S.Ed., Manchester; Charles H. Crooks, M.D., Lampang, Siam; Arthur C. H. Dickman, M.B., Ceylon; W. Gilmore Ellis, M.D., Singapore: John Crofton Fox, M.R.C.S., Northern Nigeria; Herbert B. Gibbins, M.D., London; Stephen Gudbrand, M.B., The Gold Coast; Major Richard Heard, M.B., I.M.S., Bombay; Robert C. Hiscock, M.D., Lagos, S. Nigeria; Lieutenant-Colonel W. G. King, C.I.E., I.M.S., Hatch End.; Vishnu T. Korke, M.R.C.P.Ed., Bombay; Emanuel K. Lomas, M.B., Penang; Dundas S. MacKnight, M.B., North West Rhodesia; Edward L. Mansel, M.D., London; John G. Morgan, M.R.C.S., Nyasaland; Richard Mugliston, M.R.C.S., The Gold Coast; W. A. Nicholson, M.B., Sierra Leone; W. A. Ojumire Taylor, M.B., Sierra Leone; Hyalmar Ostrom, M.D., Congo Belge; Mabel Pantin, L.M.S.S.A., Foochow; J. Sydney Pearson, M.R.C.S., Sierra Leone; Beaumont Percival, M.B., W. A. Medical Staff; Eric Pockley, M.B., Killara, New South Wales; Eric James Powell, M.B., Dublin; Dawson C. Robertson, M.B., London, S.W.; Colin F. Simpson, M.B., Fraserburgh; C. Frederick Strange, M.R.C.S., Hangchow; John W. Tomb, M.B., Belfast; James W. Thomson, M.B., W. A. Medical Staff; Frederick G. Thompson, M.B., The Gold Coast; Charles E. Vail, Miraj, India; Reginald Willan, M.R.C.S., Northern Nigeria; Lilian E. Watney, M.B., Paoning, W. China; Espine F. Ward, M.B., Castle Connell; David P. Williams, M.R.C.S., Tarkwa; Captain William D. Wright, M.B., I.M.S., Bombay.

Personal Notes.

INDIA OFFICE.

From November 11 to December 9.

Arrivals reported in London.—Major A. Gwyther, I.M.S., B.; Major A. M. Fleming, I.M.S., B.; Captain H. B. Foster, I.M.S., B.; Captain J. W. Illius, I.M.S., M.; Lieutenant-Colonel W. H. Gray, I.M.S., B.; Major S. Evans, I.M.S., Bo.; Captain R. McCarrison, I.M.S., B.; Captain A. J. H. Russell, I.M.S.; Major A. W. R. Cochrane, I.M.S., B.; Colonel F. C. Reeves, I.M.S.; Colonel R. W. S. Lyons, I.M.S.; Lieutenant V. P. Norman, I.M.S.

Extensions of Leave.—Major R. G. Turner, I.M.S., B., 7 d.; Captain J. P. Cameron, I.M.S., M., 3 m.; Captain R. G. G. Croly, I.M.S., 10 d.; Major D. R. Green, I.M.S., B., 2 m. M.C.; Lieutenant-Colonel W. Westropp White, I.M.S., 10 d.; Major S. Anderson, I.M.S., B., 1 d.

Permitted to Return.—Lieutenant-Colonel J. Penny, I.M.S., B.

LIST OF INDIAN CIVIL OFFICERS ON LEAVE (INCLUDING MILITARY OFFICERS UNDER CIVIL RULES).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Cochrane, Major A. W. R., I.M.S.
Evans, Major S., I.M.S., Bo., 13 m., October 12, 1911.
Fleming, Major A. M., I.M.S.
Foster, Captain H. B., I.M.S., B., 24 m., March 30, 1911.
Gray, Lieutenant-Colonel W. H., I.M.S., U.P., 24 m., August 1, 1911.
Gwyther, Major A., I.M.S., B., 15 m., October 16, 1911.
Harrison, Major C. B , I.M.S., M., 12 m., September 6, 1911.
Illius, Captain J. W., I.M.S., M., 24 m., October 19, 1911.
Jameson, Lieutenant-Colonel J. B., I.M.S., Bo., 18 m. 14 d., June 16, 1911.
Little, Captain J. W., I.M.S., N.-W.F. Prov., 23 m., May 10, 1910.
Long, Captain W. C , I.M.S., M.
Lumsden, Lieutenant-Colonel P. J., I.M.S., Res. Surgeon, Hyderabad, 10 m., April 5, 1911.
McPherson, Captain J., I.M.S., Res. Surg., Turkish Arabia, 14 m., April 17, 1911.
McCarrison, Captain R., I.M.S., India Foreign, 16 m., October 20, 1911.

McCoy, Captain J. W., I.M.S., E.B. and A., 23 m., March 16, 1910.
Melville, Major H. G., I.M.S., Lahore, 12 m., October 3, 1911.
Oxley, Captain J. C. S., I.M.S., C.P., 20 m. 20 d., October 29, 1910.
Penny, Major J., I.M.S., Burma, 23 m., February 21, 1910.
Turner, Major R. G., I.M.S., U.P., 9 m. 11 d., April 11, 1911.
Williams, Captain T. S. B., I.M.S., 24 m., May 20, 1911.

LIST OF INDIAN MILITARY OFFICERS ON LEAVE.

Showing the Name, Regiment, or Department, and the Period for which the Leave was granted.

Babington, Captain J. W. H., I.M.S., 1 y., from September 5, 1911.
Boalth, Captain W. H., I.M.S., 8 m., from May 13, 1911.
Edwards, Lieutenant-Colonel W. R., I.M.S.
Gilbert, Lieutenant-Colonel C. E. L., I.M.S., 18 m., from September 24, 1910.
Graves, Major D. H., I.M.S., 1 y., from March 28, 1911.
Harris, Captain E. T., I.M.S., 12 m., from January 26, 1911.
Moorhead, Major A., I.M.S., 15 m., from November 28, 1910.
Munro, Captain E. B., I.M.S., 1 y., from May 19, 1911.
Reinhold, Captain C. H., I.M.S., to March 14, 1912.
Strickland, Lieutenant-Colonel P. C. H., I.M.S.
Trafford, Captain W. L., I.M.S., 1 y. 9 m., from March 14, 1911.
Wright, Captain W. D., I.M.S., 1 y., from March 24, 1911.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"The Journal of the American Medical Association," vol. lvii., No. 21, November 18, 1911.

Pellagra.—Crowell reports on nineteen cases of pellagra treated with salvarsan. He considers that the results of this treatment have been very satisfactory—the patients will require to be carefully watched, however, to see if there is any return of the symptoms next spring. Crowell hopes that the publication of his report will be the occasion of an increased trial of salvarsan, because heretofore no drugs have seemed to have any very beneficial effect on the disease.

"Parasitology," vol. iv., No. 3, October 24, 1911.

A New Herpetomonas.—Strickland in the above number of "Parasitology" describes a herpetomonas parasitic in the alimentary tract of the common green-bottle fly, *Lucilia* sp. The parasite inhabits the alimentary tract of two species of Lucilia. In addition it has a resting stage—the "cyst"—which is passed in the voided excrement of the insect. These taken up by other flies spread the infection. Strickland proposes that the name of this parasite be *Herpetomonas luciliæ* and that the genus *Herpetomonas* should be defined so as to include the forms described as *Leptomonas.*

"Archives de Parasitologie," Tome xv., No. 1, October 20, 1911.

Sporotrichosis. — Beurmann and Gougerot write on sporotrichosis and give a botanical classification of the pathogenic forms. They state that there are seven species or less, as follows: (1) *Sp. Schenckii* (Smith, 1898; Hektoen and Perkins, 1900); Beurmann and Gougerot, 1906. (2) *Sp. Beurmanni*, Matruchot et Ramond, 1903-1905. (3) *Sp.* (?) *Dori*, Beurmann et Gougerot, 1906. (4) *Sp. Gougeroti*, Matruchot, 1907-1910. (5) *Sp. asteroides*, Splendore, 1908-1909. (6) *Sp. indicum*, Castellani, 1909. (7) *Sp. Jeanselme*, Brumpt and Langeron, 1910.

"Yellow Fever Bureau Bulletin," vol. i., No. 7, November, 1911.

Seidelin, discussing the etiology of yellow fever, believes that he has found protozoal parasites in such cases. Certain resemblances, he believes, make it probable that this supposed yellow fever parasite belongs to the family of *Babesiidæ*, but he thinks it would be unjustifiable to include it in any of the established genera. Such being the case he has proposed the name *Paraplasma flavigenum*, g. n., sp. n., for the bodies seen by himself. It is difficult to decide whether these have any etiological significance or not, and one would like to see their presence confirmed by other competent authorities before coming to any definite conclusion on the subject. A coloured plate is appended to the report.

"Journal of the Royal Army Medical Corps," No. 6, December, 1911, vol. xvii.

Kala-azar.—Leishman critically reviews the work done within the last four years on kala-azar and Oriental sore. He believes that no classification can be accepted as final at the present moment. He states that the possibility cannot altogether be excluded of both of these groups of disease being due to one parasite, though this is extremely improbable. The difficulty, as he says, lies in the fact that the two parasites, *L. donovani* and *L. tropica*, are indistinguishable morphologically, and at present it is not possible to detect any constant and definite distinction, either in their pre-flagellate or developmental forms. So far as known at present infantile kala-azar also differs from true kala-azar, and the parasite associated with it is known as the *L. infantum*. There are many points yet evidently requiring solution in this interesting branch of tropical medicine.

"British Medical Journal," December 16, 1911.

Leprosy.—Captain Williams in a lecture on leprosy (a new view of its bacteriology and treatment) delivered at the London School of Tropical Medicine advances the idea that the lepra parasite is not an acid-fast bacillus belonging to the fission fungi, but that it is a very pleomorphic streptothrix, which, in addition to changes in form, exhibits marked changes in its staining reactions in regard to the quality known as acid-fastness. Major Rost published a somewhat similar work in 1904, but considerable doubt was then thrown on the correctness of his conclusions. Captain Williams, however, considers that these results of Major Rost's, especially in the light of recent research, are very important, and entitled to serious consideration, and his own work would seem to bear out this contention.

Notices to Correspondents.

1.—**Manuscripts sent in cannot be returned.**

2.—**As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.**

3.—**To ensure accuracy in printing it is specially requested that all communications should be written clearly.**

4.—**Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.**

5.—**Correspondents should look for replies under the heading "Answers to Correspondents."**

Original Communications.

WEIGHTS OF ORGANS.

By Lieutenant-Colonel R. H. Castor, I.M.S.

In The Journal of Tropical Medicine and Hygiene of June 15, 1910, there is a leader on "The Scientific Interest attaching to a Knowledge of the Weights of Organs of Different Peoples and Races," and in it a hope is expressed that others "should favour the Journal with information of the same description." I meant to do so earlier, as I had already collected statistics for this purpose, and I hope the following tables and notes will prove of sufficient interest for publication.

Haran gives a miscellaneous list of 160 male adults, twelve female adults, and the rest adolescent males and children. Dr. Waddell, in his "Medical Jurisprudence for India," gives the weights of organs for a variable number of persons consisting of adult natives of Bengal and Bihar. In Table I. these figures are seen with mine, and it will be noted how close Waddell's figures are to mine in the column for averages, though he had two or three times the number of cases I had. It clearly shows, therefore, that the averages taken from even 100 cases vary very little when compared with averages for a much larger number. I must also add that my Indian list consisted of Southern Indians (70 per cent.) and Northern Indians (30 per cent.), so this will partly account for the very slight variations in the average weights column. The maximum and minimum weights of organs are bound to deviate a good deal from the normal owing to the

Table I.—Weights of Male Organs of Races compared.

No.	Organs	Maximum				Minimum				Average			
		Waddell	Castor		Haran	Waddell	Castor		Haran	Waddell	Castor		Haran
		Indians	Indians	Burmans	Africans	Indians	Indians	Burmans	Africans	Indians	Indians	Burmans	Africans
		lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.
1	Brain ...	3 8	4 0	3 12	3 10½	2 1	2 0	2 2	2 3½	2 12	2 12	2 15	2 11
2	Heart ...	1 4	1 12	1 10	1 4	0 4	0 3	0 5	0 5	0 7½	0 8	0 10	0 9
3	Right lung ...	3 4	3 0	3 9	4 8¾	0 5	0 5	0 8	0 7¾	1 0	1 0	1 7	1 2
4	Left lung ...	2 11	2 4	3 6	4 1	0 5	0 4	0 6	0 5½	0 14½	0 14	1 2	0 15
5	Liver... ...	6 12	4 14	4 12	5 15	0 13	0 13	1 3	0 4½	2 12	2 11	2 14	3 4
6	Spleen ...	4 0	1 8	2 0	2 13	0 1	0 1	0 2	0 2¾	0 10½	0 7	0 7	0 12
7	Right kidney	0 8	0 9	0 8	0 11¾	0 2	0 1	0 3	0 2¾	0 3¾	0 4	0 5	0 5
8	Left kidney ...	0 8	0 8	0 8	0 10	0 2	0 1½	0 2	0 2¼	0 3¾	0 4	0 5	0 4
9	Pancreas ...	—	0 6	0 5	—	—	0 1	0 1¼	—	—	0 3	0 3	—

Remarks.

(A) *Waddell's Weights* are taken from 143 cases for brain; heart, 288 cases; lung, 224 cases (each); liver, 333 cases; spleen, 314 cases; kidneys, 246 cases (each).

(B) *Castor's Weights* are taken from 34 cases for brain for Indians; the rest are from 100 cases for all organs, except the pancreas for Indians, for which there were 74 cases.

(C) *Haran's Weights* are taken from 100 cases for all organs.

It is well known that *post-mortem* examinations in the Tropics present certain differences from those in temperate climates, because the changes are more rapid, and therefore putrefaction readily occurs. During these *post-mortems* I did not come across many abnormalities, but the several occasions revealed abnormal appearances under different conditions. It is also necessary to mention that the dimensions of organs given in the various text-books vary—*e.g.*, lungs vary from 23 to 24 oz., liver from 45 to 60 oz., and the intestines (small) from 15 to 30 ft. Under these circumstances, I am taking the average of these figures as my standard for European weights for all the organs referred to in this paper.

It is my aim to make the comparison as close as possible, and I have taken 100 cases from the published list of Dr. Haran, and have compared them with 100 cases of my own. I find that Dr. pathological conditions existing in the organs, excepting, of course, tumours, which are not taken into account in any of the lists. I am glad I was able to go further than either Waddell or Haran, inasmuch as I am able to give the weights of the pancreas, and the lengths of the stomach and intestines, which, to me at any rate, are very interesting. With these preliminary remarks I append Table I., which gives at a glance the principal features in the comparison.

Brain (average weight, European, 3 lb. 2 oz.).—The averages given in the table are thus: For Burmans, 2 lb. 15 oz., Indians 2 lb. 12 oz., and Africans 2 lb. 11 oz. The Indians claim the maximum weight (4 lb.) as well as the minimum weight (2 lb.), while the Burman lies between the Indian and the African for both these weights. I have not been able to discover the heaviest brain on record for Europeans, but Byron's and Cromwell's

brains are said to have weighed almost 5 lb. each—while others equally distinguished, and more so, have had brains weighing less; but as a rule brains of eminent persons are often said to weigh several ounces heavier than the average person.

Heart (average weight, European, 10 oz.).—The Burman has the average equal to this, then comes the African and the Indian. The Indian again claims the maximum and minimum for this organ. Osler gives 3 lb. 5 oz. as "the heaviest heart on record" for hypertrophy, and states "weights over 25 oz. are rare." It will be seen that the Indian and Burman in my list have maximum hearts over 25 oz.

Right Lung (average weight, European, 24 oz.)—The Burman average nearly equals the European standard. The African's is 5 oz. less, and the Indian's 7 oz. less. The maximum is highest in the African, and the minimum is again seen in the Indian.

Left Lung (average weight, European, 20 oz.)—The Burman's average is only 2 oz. less than this, while the African and Indian are again below. The maximum and minimum weights go to the races mentioned for the right lung.

In recording the weights for the lungs it is essential to note the time the *post mortem* takes place after death of the patient, as these organs weigh heavier the longer this interval is, and this no doubt partly accounts for some of the maximum weights given. Osler gives as much as 7 lb. for the weight of a lung which was attacked with lobar pneumonia. In Haran's case the patient also died from pneumonia (weight of lung 4 lb. 8¾ oz.).

Liver (average weight, European, 3 lb. 7 oz.).—The averages are: African 3 lb. 4 oz., Burman 2 lb. 12 oz., and the Indian 2 lb. 11½ oz.

The maximum weight is highest in the African, viz., 5 lb. 15 oz., and lowest also in the African, 4½ oz. Leonard Rogers, in his recent paper on "Cirrhosis of the Liver," states that about 5 lb. is the usual weight of a liver in a European, but I think this is an over-estimation of the weight. He also states "a little under 3 lb." as the weight of the liver of a native. In Haran's case the African whose liver weighed 5 lb. 15 oz. died of pneumonia, and the patient who had a liver weighing 4½ oz. died of phthisis. This seems to be an extraordinarily low weight for the liver, for his next highest is 1 lb. 1½ oz., which approximates more closely the minimum weights for this organ in the other races.

Waddell's maximum weight for the liver is 6 lb. 12 oz., and this patient died of dysentery. We know that in hypertrophic cirrhosis of the liver one meets with the greatest weights for this organ, and Osler mentions as much as 8 lb. as the weight noted.

Spleen (average weight, European, 6 oz.).—The average is highest in the African (12 oz.), then Burmans and Indians, who are equal, but 5 oz. less. The maximum is seen in the African, if Waddell's figures are excluded, and the minimum is with the Indian (1 oz.).

It will be noticed that this is the *only* organ in the body whose average weight is more than that of the European, and no doubt this is accounted for by malaria. Waddell's case of 4 lb. is one in point where the patient died from malarial fever. In leukæmia this organ produces its heaviest developments and is stated to weigh anything between 2 lb. and 18 lb.

Right Kidney (average weight, European, 5 oz.).—The Burman and African equal the European average for this organ, while the Indian is 1 oz. less. The African claims the maximum and the Indian the minimum.

Left Kidney (average weight, European, 5 oz).—The Burman is the only Eastern race that comes up to the European average, the Indian and African are less by 1 oz. each. The maximum and minimum are claimed by the same races as for the right kidney, just as is the case with the lungs.

Pancreas (average weight, European, 3 oz.).—Neither Haran nor Waddell gives weights for this organ, so unfortunately comparisons cannot be made. My figures are taken from 100 cases for Burmans and 74 cases for Indians. The averages for both Burmans and Indians equal the European average. The maximum and minimum weights are both claimed by the Indians.

Stomach (average European measurements, length 11 in., breadth 4½ in.).—For this organ I was only able to get the following particulars. For Indians the length was taken from 63 cases; the breadth unfortunately was not noted. For Burmans the length was taken from 77 cases, and the breadth from 17 cases. For Burmans the maximum length was 18 in. and breadth 6½ in.; the minimum was 4½ in. for length and 3½ in. for breadth. The averages were 11 in. and 5 in. respectively, which is practically the same as the European standard. I regret the weights for this organ were not noted. For Indians the maximum length was 12 in., the minimum length was 8 in., and the average 12 in. It will be seen, therefore, that the Indians average the bigger stomach.

Intestines (average European, small intestines 21¾ ft., large intestine 5 ft.).—The length of the small intestines by Treves is 22½ ft., by others only 20 ft., so the average is taken here, viz., 21¾ ft.

I was able to get 100 cases from among the Burmans and 63 cases from Indians. For Burmans the maximum for the large intestines was 7 ft. 6 in., the minimum 4 ft., and the averege 5 ft. For the small intestine the maximum was 36 ft., the minimum 15 ft., and the average 24 ft.

For Indians the maximum for the large intestines was 6 ft. 6 in.. the minimum 3 ft., and the average 4 ft. For the small intestines the maximum was 32 ft., minimum 15 ft., and the average 21 ft.

The Burmans have therefore the longer intestines, both large and small, and the Indians the larger stomachs.

Treves says that the European extremes of length for the small intestines are between 15 and 30 ft. The Burman and the Indian both exceed this maxi-

mum, while the minimums are very close to one another. I recently had a case in a Southern Indian whose large intestines measured 5 ft. 7 in., and whose small intestines measured 40 ft., which I should think was the highest on record. I did not include this case in my figures, as I had finished my tables when I came across this patient.

My next comparison was made with regard to women. I have taken the twelve females from Haran's list, a variable number from Waddell, and I have only records for ten cases. The comparisons are well brought out in the following table:—

Liver (average European weight, 3 lb. 2 oz.).—The African comes up closest to this average, then the Burman, and lastly the Indian. The African, as usual, claims the maximum and the Indian the minimum weight for this organ.

Kidneys (average European weight, 4½ oz. each).—It will be seen from the table that the maximum weight for the right kidney is claimed by the Indian, while the left kidney goes to the African. The minimum of both go to the Indian. The highest averages for both to the African.

Pancreas (average European weight, 3 oz.)—

TABLE II.—WEIGHTS OF FEMALE ORGANS OF RACES COMPARED.

No.	Organ	Maximum			Minimum			Average		
		Waddell	Castor	Haran	Waddell	Castor	Haran	Waddell	Castor	Haran
		Indians	Burmans	Africans	Indians	Burmans	Africans	Indians	Burmans	Africans
		lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.
1	Brain	2 10	3 0	3 1¼	1 10	2 7	2 4¾	2 5	2 12	2 8
2	Heart	0 9	0 10	0 12¼	0 4	0 7½	0 3¾	0 6	0 8	0 7
3	Right lung ...	1 4	1 3	2 1½	0 6	0 7	0 6¾	0 9½	0 11	0 14
4	Left lung ...	1 1	0 14	1 10¼	0 4	0 5½	0 6	0 9½	0 8	0 13
5	Spleen	3 0	0 6	0 11	0 1	0 1	0 3¼	0 6½	0 3	0 7
6	Liver	3 14	3 0	4 6¾	1 0	1 14	1 13	2 5½	2 9	2 14
7	Right kidney ...	0 6	0 4	0 5¾	0 1	0 3	0 2¾	0 3½	0 3½	0 4
8	Left kidney ...	0 6	0 5	0 7¾	0 1	0 3	0 2¾	0 3½	0 3½	0 4
9	Pancreas	—	0 3	—	—	0 1			0 2	

REMARKS.

(A) *Waddell's Weights* are taken for brain from 7 cases, heart 46 cases, lungs 49 cases (each), spleen 91 cases, liver 88 cases, and kidneys 68 cases (each).

(B) *Castor's Weights* taken from 10 cases for all organs.

(C) *Haran's Weights* taken from 12 cases for all organs.

Brain (average European weight, 2 lb. 12 oz.).—The Burman's average is the same as the above, and is higher than either the Indian or the African. The maximum goes to the African, and the minimum to the Indian.

Heart (average European weight, 8¾ oz.).—The Burman's average is 8 oz., while the African and the Indian are 7 oz., and 6 oz. respectively. The maximum and minimum go to the African and the Indian respectively.

Right Lung (average European weight, 1 lb. 1 oz.).—The African has the highest average (14 oz.) and the Burman comes between her and the Indian. The African's maximum is 2 lb. 1½ oz., while the Indian has the minimum (6 oz.).

Left Lung (average European weight, 15 oz.).—The African nearly approaches the average, and the Burman has the lowest. The maximum and minimum, as usual, go to the African and Indian.

Spleen (average European weight, 6 oz.).—The Burman female has only half the average weight for this organ when compared with the others. The African and Indian are very close to one another, and both are higher than the European average. The maximum goes to the African, and the Burman and Indian share the minimum.

For this organ I am only able to give figures for the Burmans, as neither Waddell nor Haran gives the weights for this organ. The details are seen in the table.

The spleen, pancreas and kidneys are the only organs in the body in which the female weights are practically the same as the male weights for these organs.

REMARKS.

(1) The Burman male claims *no maximum* weights. He has the *highest averages* for the brain, heart, lungs, and left kidney, and shares that of the right kidney and pancreas with the African and Indian respectively. He lies between the African and Indian in all the *minimum* weights of the organs.

(2) The Burman female also lays no claim for the *maximum* weights for any of the organs. She has the *highest averages* for the brain and heart, and lies generally between the Indian and African for the *minimum* weights; excepting the spleen, which she shares with the Indian.

(3) The Indian male claims the *maximum* weights for the brain, heart, and pancreas, and if Waddell's figures are included, also for the liver and

spleen. He also claims *all* the *minimum* weights for the organs if the African 4½ oz. liver is excluded. He shares only *one average*, and that is for the pancreas, which he does with the Burman.

(4) The Indian female has the *maximum* weight for the right kidney only, the *minimum* weight for all the organs except the heart, and shares the minimum weight for the spleen with the Burman. For the *highest averages* she only shares the pancreas with the Burman. It is interesting to note that both the male and female Indians claim the *minimum* weights for the great majority of the organs.

(5) The African male lays claim for the *maximum* weights for all the organs except the brain and heart, if we exclude Waddell's figures for the liver and spleen. He holds the *minimum* weight for the liver (4½ oz.), which I think may be a mistake. He holds the *highest average* for the liver and spleen and shares the right kidney with the Burman.

(6) The African female also lays claim to the *maximum* weights for all the organs except the right kidney, the minimum for the heart only, the *highest averages* for all the organs except the brain and heart.

(7) With regard to the stomach and intestines, I have already pointed out that the Indian has the longer stomach, while the Burman has the longer intestines, both large and small.

(8) In making a comparison of these weights with the European averages it will be seen that the Burman approaches the European standard more closely than any of the other races. With regard to the heart, kidneys and pancreas the Burman's average is exactly the same and he closely approaches it for

WEIGHTS OF CERTAIN ORGANS OF BURMANS.

No.	Name	Pancreas	Stomach		Intestines	
			Length	Breadth	Large	Small
		oz.			ft.	ft.
1	Nga Te ...	3	13	6½	5	23
2	Mg Po Ton ..	3	12	5	5	21½
3	U Tha Dun ..	1	10	4½	5	22
4	Nga Tha Baw	2	10	5½	5	25
5	Mg Po Sine ...	2	12	5½	4½	20
6	Mg Kya ...	2	10	5	4½	20
7	San Ya ...	1	8	5	4½	32
8	Mg San Dwe ...	3	16	6	5	22
9	Kala Bo Tin ...	3	8	4	4½	21
10	Mg Gyan ...	2	10	5	4½	16½
11	Nga Bo Khe ..	3	12	6	5	30
12	Nga Po Hman	3	12	—	5	26
13	Nga Hmon .	4	12	—	4	19½
14	Po Maung ...	3	12	—	5½	24
15	Nga Hmaw ...	3	12	—	6	20
16	Tha Hman ...	4	12	—	5	25
17	Nga Pyaw ...	3	12	—	4	16½
18	Po Mait ...	4	18	—	5	15
19	Nga Pe ...	4	12	—	5	15½
20	Po Tok... ...	3	12	—	4½	30
21	Kyaw Min ...	2½	11	—	5	36
22	Po Thein ...	3½	12	—	5	21
23	Nga Po Lin ...	4	12	—	6	25
24	San Aung ...	4	11	—	5	28
25	Mg Po Sine ...	2	12	5½	4½	31
26	Mg Kyo ...	2	10	5	5	33
27	Nga Tha Baw...	2	10	5½	4½	30
28	Nga PoHme ...	1	10	4½	5½	28

WEIGHTS OF CERTAIN ORGANS OF BURMANS—*continued.*

No.	Name	Pancreas	Stomach		Intestines	
			Length	Breadth	Large	Small
		oz.			ft.	ft.
29	Aung Myin ...	2	11	5½	5½	30
30	Aung Myin ...	1	7	3½	4½	27
31	Maung Chan ...	3	12	—	6	26
32	Mg Shwe Baw	3	4½	—	4½	27
33	Po Khet ...	3	6	—	6½	25
34	Mg San Gwe ...	3	6		7	26
35	Mg Mya Tha U	3	6	—	4	27½
36	Nga Po Thaik	3	12	—	5	21
37	Min Gyaw ..	4	12	—	4	22½
38	Lun Aung ..	3	12	—	5½	25½
39	Hla Gyi ...	4	12	—	5	24
40	Shwe Kyin ...	3	12	—	4½	18
41	Nga Lun Pe ...	4	12	—	4½	24
42	Shwe Yauk ...	3	12	—	4½	25
43	Saw Pe ..	5	12	—	4½	24
44	Nga Po Hmaw	4	12	—	5½	25
45	Mg Hla Baw ...	1½	12	—	5½	24
46	Po Myin ...	3	11	—	4½	21
47	Lu Pe	3	12	—	4½	24
48	Mg Pyi Tha ...	3½	12	—	4	24
49	Mg Hman ...	2	12	—	5½	25
50	Po San... ...	3½	12	—	5	25½
51	Po Mya ...	2½	12	—	6	20
52	Mg Ka... ...	2½	12	—	7½	29
53	Mg Maung ...	3	14	—	6	28½
54	Nga Tit ..	4	12	—	4	21
55	Kya Pyu ...	4	12	—	6	30
56	Shwe Thin ...	4	12	—	5	21
57	Net Pya ...	3	12	—	5	21
58	Aung Myat ...	5	12	—	5	20
59	Balmay ...	5	12	—	4½	25½
60	Mg Shwe Aung	2	—	—	4	17½
61	Mg San ...	3½	12	—	5½	22
62	Po Saw ...	3	12	—	4	22
63	Lu Say ...	3	12	—	5½	27
64	Han Haung ...	4	12	—	4½	23½
65	Po Saw ...	4	12	—	4½	20½
66	Po Min ...	2	12	—	5	22½
67	Shwe Gon ...	2	12	—	5	23
68	Po Sein ...	3	12	—	4½	22½
69	Kyaw Zan Pye	2	12	—	5	22
70	Po Kyaw ..	2	11	—	4	18
71	Mg Nyo ...	2	12	—	6	28
72	Mg Ba ...	0½	5	—	6	26
73	Po Oh	2	12	—	6	26
74	Nga Kyaw Sok	2	—	—	4½	27
75	Ma Hla Min ...	3	—	—	5	29
76	Ma Khwe ...	2½	—	—	7½	33½
77	Aung Chin ...	2	—	—	4½	24
78	Shwe Hmaw ..	2½	—	—	5½	24½
79	Mg Min Maung	2	—	—	5½	15½
80	Mg Shwe Aung	2	—	—	5	21½
81	Po Sin... ...	1½	—	—	4½	25
82	Mg Hmaw ..	2	9	—	6	24
83	Mg Pi Tha ...	3	—	—	5½	1½
84	Po Thein ..	3½	—	—	5½	34
85	Mg Po Sin ...	2	—	—	6½	32
86	So Ba	2	—	—	5½	25
87	Mg Po Sa ..	4	—	—	5	25
88	Mg Ba Thin ..	2	—	—	5½	24½
89	Mg Shwe Yon	1	—	—	4	22½
90	Shwe Po ...	1½	—	—	5	22
91	Mg Phon ...	1	—	—	5	21
92	Mg Po Chaw ..	2	—	—	5	22
93	Nga Kwin Pan	2	—	—	4½	23
94	Mg Po Min ...	2	—	—	4½	16
95	Nga Tun Myin	1¼	—	—	5½	27
96	Tha Lu ...	2	13	—	6	23
97	Po So	2	12	—	6	24½
98	Bagale	3	12	—	6	24½
99	Ko Po Aung ...	4	—	—	6½	26
100	Po Hmin ..	5	—	—	5½	30

WEIGHTS OF ORGANS OF BURMANS.

No.	Name	Age	Sex	Disease	Brain	Heart	Right lung	Left lung	Liver	Spleen	Right kidney	Left kidney
					lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.
1	Nga Pet	50	Male	T. of lung	2 2	0 8	1 5	0 11	2 0	0 5	0 4	0 4
2	Nga On	32	,,	,, ,,	2 12	0 11	2 7	2 7	2 12	0 3	0 4	0 4
3	Nga Mu	67	,,	,, ,,	2 10	0 9	2 7	2 0	2 6	0 3	0 4	0 4
4	Nga Shwe So	27	,,	Enteritis	2 2	0 11	0 12	0 11	3 9	0 10	0 5	0 5
5	Nga Tha Maung	41	,,	Septicæmia	2 12	0 7	1 15	1 0	2 5	0 5	0 4	0 4
6	Nga Pan	50	,,	Hæmorrhage of brain	2 13	0 7	0 12	0 12	2 12	2 0	0 4	0 4
7	Nga Pe(a)Po Lan	64	,,	Intestinal obstruction	2 12	0 10	1 2	0 14	2 4	0 4	0 4	0 4
8	Nga Pe	46	,,	Shock	2 10	0 8	1 9	0 12	1 8	0 5	0 3	0 3
9	Aung Kaing	37	,,	Injury (shock)	3 7	0 8	0 14	0 12	2 12	0 4	0 3	0 3
10	Shwe Oh	63	,,	T. of lung	3 0	0 12	1 13	1 5	2 4	0 4	0 5	0 4
11	Kyaw Khine	30	,,	Pneumonia	3 1	0 10	3 6	0 14	2 8	0 4	0 5	0 6
12	Kyaw Yan	25	,,	Hæmorrhage of brain	2 12	0 11	2 6	1 6	3 8	0 11	0 6	0 6
13	Shwe Yin	38	,,	Nephritis	2 13	0 13	1 0	0 14	3 8	0 4	0 4	0 4
14	Nga Kyaw	64	,,	T. of lung	3 1	0 14	1 5	0 13	3 12	0 8	0 7	0 7
15	Nga Pu	24	,,	Septicæmia	2 10	0 6	1 7	1 2	2 12	0 3	0 3	0 4
16	Nga Seik	34	,,	T. of lung	2 12	0 11	0 9	0 9	3 14	0 6	0 4	0 5
17	Tha Dun	59	,,	Remittent fever	3 7	0 11	1 13	1 2	2 0	0 4	0 4	0 4
18	Nga Pyaung	39	,,	Dysentery	2 12	0 8	0 14	0 13	3 0	0 9	0 4	0 4
19	Maung Gyi	61	,,	T. of lung	3 1	0 9	0 8	0 6	3 0	0 3½	0 3	0 3
20	San Hla	35	,,	,, ,,	3 12	0 7	1 5	1 4	2 8	0 6	0 4	0 4
21	Po Hlaing	27	,,	Pneumonia	3 0	0 7½	1 11	1 8	3 0	0 6	0 4	0 5
22	Yan Byo	50	,,	T. of lung	3 0	0 11	1 2	1 1	4 0	0 12	0 5	0 5
23	Nga Pein	56	,,	,, ,,	3 1	0 9	1 13	1 8	2 3	0 4	0 5	0 2
24	Nga Kywet Sot	43	,,	Septicæmia	2 10	0 6	0 10	0 8	2 2	0 5	0 3	0 4
25	San Chein	29	,,	Leprosy	2 14	0 12	1 13	0 13	3 10	0 11	0 5	0 5
26	Tha Zan	37	,,	Dysentery	3 1	0 8	0 9	0 8	2 11	0 2	0 3	0 4
27	Nga Nyun	40	,,	T. of lung	2 15	0 6	1 13	1 11	2 4	0 6	0 4	0 5
28	Po Saing	54	,,	Bronchitis	2 12	1 5	0 15	0 9	2 0	0 3	0 4	0 4
29	Tha Zan	38	,,	Dysentery	3 0	0 8	2 10	1 11	3 10	0 9	0 4	0 5
30	Po Tun	24	,,	T. of lung	3 3	0 7	0 15	0 14	2 8	0 7	0 4	0 4
31	Nga Po	25	,,	Cancer of Penis	2 14	0 7	2 7	1 13	2 6	0 3	0 4	0 4
32	Aung Ban	63	,,	T. of lung	3 0	0 8	3 9	1 4	1 15	0 4	0 4	0 4
33	Tha Htu	38	,,	Pneumonia	3 3	0 15	2 0	1 2	3 3	0 8	0 7	0 7
34	San U	50	,,	T. of lung	2 12	0 7	2 0	1 9	2 6	0 2	0 5	0 5
35	Po Pyu	24	,,	V. of heart (aortic)	3 5	1 4	1 15	0 15	3 14	1 15	0 6	0 6
36	Tun Min	24	,,	T. of lung	3 0	0 9	3 6	1 9	3 10	0 11	0 5	0 5
37	Po Kin	31	,,	,, ,,	3 2	0 11	1 15	1 7	2 11	0 7	0 6	0 7
38	Po Sin	27	,,	,, ,,	2 15	0 10	0 13	0 11	1 15	0 4	0 4	0 4
39	Po Yan	30	,,	Drowning	3 4	0 11	2 0	1 8	3 4	0 5	0 5	0 5
40	Tha Zan	30	,,	T. of lung	3 0	0 7	1 5	1 3	2 4	0 6	0 4	0 4
41	Kyi Min	30	,,	,, ,,	2 8	0 5	1 2	0 13	2 3	0 5	0 4	0 4
42	Pyon Cho	60	,,	Pericarditis	3 3	1 10	2 4	1 6	2 6	0 7	0 5	0 5
43	Po Saing	50	,,	T. of lung	3 0	0 10	1 4	1 4	3 0	0 4	0 4	0 5
44	Kyaw Din	31	,,	Leprosy	3 4	0 10	1 4	1 3	3 8	0 14	0 4	0 4
45	Tewe Ye	48	,,	Cirrhosis of liver	3 7	0 8	1 12	1 0	2 3	0 4	0 4	0 5
46	Nga Kyaw	69	,,	T. of lung	2 11	0 7	2 0	2 0	1 14	0 3	0 3	0 3
47	Shwe Lun	63	,,	Fatty degeneration of liver	3 0	0 11	1 1	0 12	3 8	0 6	0 5	0 7
48	Po Thaung	45	,,	Pneumonia	2 8	0 6	2 13	0 15	1 12	0 3	0 3	0 3
49	San Yun	47	,,	V. of heart (aortic)	3 0	0 10	1 8	1 4	3 6	0 15	0 5	0 6
50	Po Shan	35	,,	Cerebro-spinal meningitis	2 12	1 1	1 3	0 15	3 5	0 8	0 5	0 5
51	Nga Hlaing	25	,,	,, ,,	2 12	0 12	1 0	1 0	3 8	0 11	0 4	0 4
52	Shwe Bye	26	,,	T. of lung	3 6	0 12	0 9	0 8	4 0	1 5	0 6	0 6
53	Shwe Bye	49	,,	,, ,,	2 12	0 9	2 10	2 7	2 11	0 7	0 4	0 5
54	Po Su	18	,,	,, ,,	2 12	0 7	1 0	0 13	2 8	0 3	0 4	0 5
55	Nga Chun	25	,,	Thrombosis (lateral sinus)	3 6	0 8	0 14	0 14	3 1	0 6	0 4	0 4
56	Nga Nyun	50	,,	Lymphadenoma	2 14	0 7	1 0	0 10	2 8	0 6	0 4	0 4
57	Pan Bu	35	,,	Pneumonia	3 1	0 12	2 15	1 5	3 14	0 7	0 6	0 6
58	Po Sein	50	,,	Caculi of kidney	3 12	0 13	1 8	1 6	4 7	0 7	0 6	0 6
59	Po Lwin	30	,,	Peritonitis	2 14	0 6	0 9	0 9	1 3	0 2	0 3	0 4
60	Shwe Win	34	,,	Pericarditis	3 0	0 15	1 6	1 5	4 10	0 15	0 6	0 6
61	Kyaw Zan	55	,,	Hemiplegia	3 4	0 9	0 15	0 12	0 15	0 2	0 4	0 4
62	Nga Hman	31	,,	Anæmia	2 12	0 6	0 12	0 10	2 0	1 7	0 4	0 4
63	Tun Tha	30	,,	Dysentery	2 12	0 5	0 13	0 10	1 11	0 2	0 3	0 3
64	Pyu Aung	48	,,	Septicæmia	2 14	0 11	1 9	0 10	4 3	0 8	0 6	0 6
65	Po San	23	,,	V. of heart (aortic)	2 10	1 5	2 2	1 1	3 0	0 4	0 4	0 4
66	Kune Yon	26	,,	Abscess of liver	3 5	0 11	1 5	0 14	4 0	1 4	0 3	0 4
67	Nga Pyu	44	,,	Septicæmia	3 0	0 12	1 0	0 12	4 5	0 6	0 5	0 5
68	Nga Ni(a) Po Tun	34	,,	Erysipelas	2 15	0 14	1 5	1 5	3 2	0 10	0 5	0 5
69	Po Kyai	29	,,	T. of lung	2 14	0 8	1 14	1 14	2 5	0 4	0 5	0 6
70	Aung Ban	29	,,	,, ,,	2 8	0 6	0 15	0 13	1 15	0 5	0 3	0 4
71	Nga On(a)Ohn Gine	60	,,	,, ,,	2 14	0 11	2 2	1 10	2 8	0 6	0 6	0 6
72	Myauk Kyi	48	,,	Diabetes mellitus	3 0	0 7	1 4	1 0	3 4	0 6	0 4	0 5
73	Mg Su	34	,,	Syphilis	2 12	0 7	0 11	0 9	2 1	0 4	0 4	0 3

WEIGHTS OF ORGANS OF BURMANS—*continued.*

No.	Name	Age	Sex	Disease.	Brain	Heart	Right lung	Left lung	Liver	Spleen	Right kidney	Left kidney
					lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.
74	Shwe Kyu	48	Male	Leprosy	3 0	1 0	1 8	1 2	4 4	1 0	0 7	0 8
75	Shwe Kyu	35	,,	T. of lung	3 4	0 14	1 11	1 7	3 6	0 11	0 6	0 6
76	Nga Ba	48	,,	V. of heart (mitral)	2 10	0 14	0 13	0 11	2 7	0 4	0 5	0 4
77	Yan Maung ...	34	,,	T. of lung	2 14	0 9	1 3	0 14	2 10	0 4	0 4	0 4
78	Maung Maung ...	34	,,	Septicæmia	3 1	0 8	0 10	0 8	4 12	1 0	0 7	0 7
79	Nga Paw	58	,,	T. of lung...	2 8	0 8	2 0	0 14	2 8	0 4	0 3	0 4
80	Po Kin	24	,,	,, ,, ...	3 4	0 7	2 8	1 10	2 13	0 7	0 6	0 6
81	Taing On	21	,,	Multiple injuries...	3 4	0 8	0 10	0 10	2 0	0 4	0 4	0 4
82	Nga Ni	50	,,	Sarcoma of bone...	3 4	0 8	0 10	0 10	1 6	0 8	0 4	0 4
83	Nga Hme	54	,,	T. of lung...	3 2	0 8	2 0	1 10	2 12	0 3	0 4	0 5
84	Aung Min	32	,,	Dysentery...	2 14	0 6	0 10	0 10	1 12	0 4	0 4	0 4
85	Shwe Ye	45	,,	Pneumonia	3 0	0 12	1 12	1 10	3 6	0 9	0 6	0 6
86	Po Kin	45	,,	Cirrhosis of liver...	2 14	0 9	1 6	1 1	2 12	0 9	0 5	0 5
87	Po Nyan	17	,,	V. of heart	3 0	1 2	1 5	1 0	2 14	0 6	0 6	0 6
88	Po Su	22	,,	,, ,, ...	2 10	1 5	2 2	1 1	3 0	0 4	0 4	0 4
89	Kan Yon	21	,,	Abscess of thigh	3 5	0 11	1 5	0 14	4 0	1 4	0 8	0 4
90	Nga Pyu	22	,,	Septicæmia	3 0	0 12	1 0	0 12	4 5	0 6	0 5	0 5
91	Po Ni...	35	..	Abscess of liver	2 15	0 14	1 5	1 5	3 2	0 10	0 5	0 5
92	Po Kyai	40	,,	T. of lung...	2 14	0 8	1 14	1 4	2 5	0 4	0 5	0 6
93	Aung Baw	30	,,	,, ,, ...	2 8	0 6	0 15	0 13	1 15	0 5	0 3	0 4
94	On Gine	40	,,	,, ,, ...	2 14	0 11	2 2	1 10	2 8	0 6	0 6	0 6
95	Shwe Kyaw	36	,,	,, ,, ...	3 4	0 14	1 7	1 0	3 6	0 11	0 6	0 6
96	Nga Bu	38	,,	V. of heart	2 10	0 14	0 13	0 11	2 7	0 4	0 5	0 4
97	Yan Maung ...	40	,,	T. of lung...	2 14	0 9	1 3	0 14	2 10	0 4	0 4	0 4
98	Maung Naung ...	35	,,	Septicæmia	3 1	0 8	0 10	0 8	4 12	1 0	0 7	0 7
99	Nga Phan	28	,,	Dysentery...	2 8	0 8	2 0	0 14	2 8	0 4	0 3	0 4
100	Po Sein	24	,,	T. of lung...	3 4	0 7	2 8	1 10	2 13	0 7	0 6	0 6

WEIGHTS OF ORGANS (INDIANS).

No.	Name	Brain	Heart	Right lung	Left lung	Spleen	Liver	Right kidney	Left kidney	Pancreas	Stomach	Intestines	
												Large	Small
		lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	ft. in.	ft.	ft.
1	Sanasee	2 8	0 9	1 7½	1 2	0 4	2 11	0 4	0 4½	0 4	—	—	—
2	Pantaya	2 0	0 12	1 8	1 4	1 1	2 0	0 6	0 6	0 4	0 8	4½	20
3	Jabu	2 12	0 10	1 3	1 0	0 8½	2 0	0 7	0 6	0 5	—	5½	25
4	Tammaya	2 11	0 8	1 6	1 0	0 5	1 8	0 6	0 5½	0 4	—	5½	24
5	Perasad	2 8	0 9	1 1	1 0	1 1	2 0	0 7	0 7	0 6	—	4	19
6	Muthu	2 12	0 5½	0 10	0 4	0 7	2 8	0 9	0 6½	0 4	—	6	22
7	Jagaya	2 8	0 10	2 6	2 4	0 9	3 2	0 8	0 8	0 4	—	6	24
8	Yankaya	2 6	0 10½	2 8	2 4	1 1	4 9	0 8	0 8	0 4	—	6	28.4
9	Baleroo	3 0	0 7	1 0	0 13	0 6	1 12	0 6	0 6	0 3	—	6½	30½
10	Bishma	2 11	0 6½	0 10	0 12	1 4	2 6	0 5	0 5	0 3½	—	4	22
11	Pagudujan	2 2	0 8	1 6	1 4	0 8	2 2	0 6	0 6	0 4	—	5½	25
12	Affadu	3 4	0 9	0 14	1 6	0 10	1 10	0 6	0 6	0 3½	—	5	25
13	Appaya	2 12	0 9½	1 7	1 5	0 6	2 11	0 6½	0 6	0 4	—	5	28
14	Nowsaya	2 15	0 9½	1 10	1 4	0 6½	2 4	0 5	0 5½	0 4	—	4	24
15	Kistaroo	2 11	0 8	1 0	1 4	0 9	2 10	0 6	0 6	0 4	—	6½	22
16	Pathaga	2 8	0 9	1 6	1 4	0 10	2 8	0 8	0 8	0 3½	—	4½	30
17	Approo	2 12	0 8	0 14	0 10	0 6	2 6	0 8	0 8	0 3½	—	4	24
18	Bajana	4 0	0 8	0 14	0 11	0 8	2 8	0 6	0 6	0 6	—	3½	20
19	Apaya	No record	0 10	1 10	1 2	0 8	2 8	0 8	0 8	0 6	—	4	22
20	Makanda	—	0 8	0 10	0 8	0 4	4 6	0 4	0 4	0 4	—	4	23½
21	Achnadu	—	0 12	1 0	0 8	0 6	2 12	0 4	0 4	0 6	—	3	23
22	Ramroo	—	0 6	1 2	0 8	0 4	1 2	0 4	0 4	0 3	—	4½	20½
23	Kabitgiri	—	0 8	0 8	0 6	0 6	1 12	0 4	0 4	0 4	—	4	21½
24	Ramananda ...	—	0 12	0 14	0 12	0 2	1 14	0 6	0 6	—	—	5	20
25	Kamayah	—	0 10	1 0	0 14	0 4	2 2	0 4	0 4	0 5	—	4	17
26	Chango	—	0 8	1 6	1 0	0 2	1 6	0 6	0 6	0 4	—	4	20½
27	Chonaya	—	0 6	1 4	0 13½	0 4½	1 15	0 3½	0 3½	0 3	—	5½	25
28	Kundia	—	0 3½	0 7	0 5	0 3	1 13	0 3½	0 3½	0 1½	—	4	20½
29	Apaya	—	0 8	0 13	0 11	0 14	2 12	0 4½	0 5½	0 2	—	6	26
30	Santi	—	0 7½	0 13½	0 10½	0 5½	3 3	0 4	0 4½	0 3½	—	6	23
31	Sanasi	—	0 4½	0 8	0 7½	0 4	1 7	0 1½	0 2½	0 1½	—	6	20

WEIGHTS OF ORGANS (INDIANS)—*continued.*

No.	Name	Brain	Heart	Right lung	Left lung	Spleen	Liver	Right kidney	Left kidney	Pancreas	Stomach	Intestines	
												Large	Small
		lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	ft. in.	ft.	ft.
32	Rugnandow ...	—	0 7½	0 9	0 6½	0 11½	2 14	0 3½	0 3½	0 2½	—	5½	29
33	Ankaya	—	0 5	1 9	0 13	0 2½	1 9	—	—	0 2	—	4½	15½
34	Achroo	—	0 7	1 0	0 14	1 2	1 4	0 4½	0 5	0 4	—	4½	32
35	Woonyi	—	0 10½	1 1	0 9½	0 5½	3 1	0 5½	0 4½	0 4	—	5	30
36	Lochaya	—	0 4½	0 8½	0 7½	0 3½	1 8½	0 3½	0 3	0 1½	—	5½	25
37	Ban Ham	2 4	0 14	1 0	1 4	0 15	3 0	0 8	0 8	—	—	5	21
38	Malchosi	—	0 11	1 0	1 4	0 7	2 10	0 4	0 3½	—	—	4	17
39	Nizamatali	—	0 12	0 15	0 12	0 5	2 6	0 4	0 4	—	—	—	—
40	Gongayah	—	0 6½	0 12½	0 13½	0 3½	3 0	0 4½	0 5	0 2½	—	5½	25½
41	Bugadin	—	0 5½	0 7	0 6	0 5	1 14	0 2½	0 3	—	—	4	19
42	Nachaga	—	0 12	1 4	1 2	0 8	3 6	0 6	0 6	0 4	—	6	22
43	Lapia	—	0 10	1 14	1 14	0 7	2 2	0 5	0 5	0 3	—	6	24
44	Mahabir	—	0 8	1 0	0 14	0 8	4 0	—	—	0 3	—	6	28½
45	Makurain	—	0 8	0 14	0 10	1 1	5 0	0 4	0 4	0 2	—	4	20½
46	Deosing	—	0 10	1 2	1 0	1 0	3 4	0 5	0 5	0 4	—	6	26
47	Narcharton Panday	—	0 8	0 12	0 12	0 8	2 14	0 5½	0 5½	0 4	—	6	23
48	Yankaya	—	0 9	0 16	1 12	0 7	4 0	0 6	0 5½	0 6	—	6	20
49	Patifa	—	0 8	0 12	1 0	0 6	2 8	0 2	0 2	—	—	5½	29
50	Abdullah	—	0 8	0 10	0 10	0 6	1 4	0 2	0 2½	0 1	—	4½	15½
51	Ramkanta	—	0 8	0 8	0 10	0 8	3 12	0 6	0 4	0 4	—	4½	32
52	T. Amayah... ...	—	0 7	1 7	1 1	0 5	3 6	0 5	0 6	—	—	5	30
53	Ramaya	—	0 5	0 9	0 8	0 6	4 4	0 2	0 2	—	—	5½	25
54	Patayah	2 14	0 8	1 0	0 14	0 5	2 5	0 4	0 4		—	4	22
55	Dudari	—	0 5½	0 10	0 8	0 4	3 0	0 3	0 3	—	—	5	25
56	Ramaya	—	0 5	0 9	0 8	0 6	4 4	0 2	0 2	0 1½	—	5	28
57	Yataya	3 0	0 8	0 9	1 2	0 8	1 8	0 4	0 8	0 4	—	4	24
58	Choonna	—	0 8	1 0	0 12	0 6	2 12	0 4	0 4	0 3	—	6½	22
59	Jagarnath	—	0 8	1 2	0 14	1 8	4 6	0 6	0 6	0 1½	1 0	4½	25½
60	Apeyat	—	0 6	1 0	0 14	0 4	2 2	0 4½	0 3	0 1½	1 0	3½	20
61	Yankana	2 8	0 5	3 0	1 4	0 4	3 0	0 4½	0 5½	2 12	1 0	4	22
62	Godinga	2 8	0 6	2 8	1 6	0 5	3 8	0 4	0 4½	3 0	1 0	4	23½
63	Ankoya	—	0 10	1 3	0 10	0 4	3 0	0 5	0 4	0 3	—	3	23
64	Kayala	—	0 8½	0 10	1 6	0 4	3 0	0 4	0 3	0 3	1 0	4½	20½
65	Chutaya	2 9	0 8	0 9	1 4	0 3½	3 0	0 4½	0 3	0 3	—	5	21
66	Azarati	—	0 9	0 10	1 4	0 3	3 8	0 4	0 4	—	—	—	—
67	Gurunanda	—	0 10	1 2	1 6	0 6	3 2	0 5	0 5	—	—	—	—
68	Papaya	—	0 4	1 0	1 0½	0 5	3 0	0 5	0 5½	—	—	—	—
69	Thabow	—	0 3	0 10	0 8	0 4	1 8	0 2	0 2½	—	—	—	—
70	Moosetin	—	0 8	0 8	0 6	0 4	3 4	0 4	0 4	—	—	—	—
71	Moonswanali	—	0 10	1 0	0 14	0 8	3 9	0 4	0 4	0 4	—	—	—
72	Sami	—	0 8½	0 10	0 10	0 12	3 9	0 4	0 4	0 3½	1 0	—	—
73	Pataya	—	0 5	1 0	0 15	0 4	2 8	0 2¼	0 2¼	—	1 0	—	—
74	Lutchaya	—	0 14	2 14	1 0	0 10	4 6	0 5	0 5	0 2¼	1 0	—	—
75	Ram Shain	—	0 4½	0 10½	0 10	0 3	2 0	0 4	0 4½	0 3	—	—	—
76	Kaddy	—	0 10	0 14	0 12	0 11	4 14	0 5	0 5	0 5	—	—	—
77	Arthusain	—	0 3	0 6	0 6	0 8	1 9	—	—	0 1	1 0	—	—
78	Chandramony	—	0 8	0 5	0 5	0 1	1 14	0 3	0 3	0 2	—	—	—
79	Kamia	—	1 12	0 12	0 11	0 11	2 8	0 3	0 3	0 2	1 0	—	—
80	Sein Thaya ..	—	0 5	1 11	0 15	0 2	1 8	0 2	0 2	0 3	1 0	—	—
81	Sathigodoo	—	0 8	0 10	0 11	0 6	2 10	0 3	0 3	0 2	—	—	—
82	Patia	—	0 4	0 8	0 4	0 4	1 3	0 3	0 3	0 2	—	—	—
83	Appama	—	0 6	1 4	1 0	0 5	2 8	0 2	0 2	0 1	1 0	—	—
84	Khidu	—	0 3	0 10	0 7	0 1	0 13	0 2	0 2	0 2	—	—	—
85	Detoyat	4 0	0 10	1 6	1 2	0 1	4 0	0 6	0 6	—	—	—	—
86	Ramoyah	—	0 12	1 4	1 0	0 12	4 4	0 6½	0 6	0 2	1 0	—	—
87	Dadin	—	0 5½	0 10	0 8	0 4	3 0	0 3	0 3	—	—	—	—
88	Chowraji Pan ..	—	0 9½	0 7½	0 7	0 1¾	1 8	0 1	0 1½	—	—	—	—
89	Mahusing	2 8	0 8	0 8¼	0 9	0 37	3 9	0 3½	0 4	—	—	—	—
90	Gujan Sing ...	2 8	0 8½	0 10½	0 9¼	0 8	2 11	0 3½	0 3½	—	—	—	—
91	Mahomed	2 6	0 9	1 4	1 8	0 5	3 0	0 3¼	0 3	—	—	—	—
92	Mahbir	3 0	0 10	1 2	1 5	0 9	4 0	0 4	0 6	—	—	—	—
93	Soban	2 11½	0 7¼	0 9½	0 8	0 4	2 0½	0 3½	0 2½	—	—	—	—
94	Mahmed	2 2	0 8	0 13	0 8	0 10	2 0	0 3	0 2½	0 1	—	—	—
95	Ramaswami ...	3 4	0 6	0 5¾	0 5½	0 3	2 0½	0 3	0 3½	0 1	—	—	—
96	Mangal	2 12	0 13	1 9	1 7	0 9½	3 5	0 4¾	0 6	0 1	—	—	—
97	Kissen	2 15	0 9	0 7	1 0	0 5	3 1	0 5½	0 4¾	—	—	—	—
98	Maya	—	0 6¾	1 0	1 1	0 2¾	2 11¼	0 4¼	0 5¼	0 2¾	—	—	—
99	Bawa	—	0 12½	0 11¼	0 12	0 7½	2 14	0 4½	0 4½	0 5	—	—	—
100	Fathoo	—	0 6	0 11	0 7¾	0 3¾	2 1½	0 3¾	0 3¾	—	—	—	—

WEIGHTS OF FEMALE ORGANS OF BURMANS.

No.	Name	Brain	Heart	Right lung	Left lung	Liver	Spleen	Right kidney	Left kidney	Stomach		Large Intestines	Small Intestines	Pancreas
										Length	Breadth			
		lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	in.	in.	ft. in.	ft. in.	oz.
1	Ma Sein ...	No record	0 8	0 3	—	3 0	0 2	0 2	0 2	9	0	4½ 0	20 0	2
2	Me Oh	2 12	0 10	0 12	0 10	1 14	0 2	0 4	0 4	No record	No record	No record	No record	No record
3	Ma Gyi ...	No record	0 8	0 10	0 8	2 5	0 2	0 4	0 5	,,	,,	,,	,,	,,
4	Ma Hin Te	,,	0 8	0 7	0 5½	2 0½	0 6	0 3½	0 3½	,,	,,	5 0	24 0	2
5	Mah Tok .	,,	0 8	0 7	0 5½	2 0½	0 6	0 3½	0 3	,,	,,	5 0	24 0	2
6	Ma Sein ...	3 0	0 8	0 10	0 8	2 8	0 1	0 4	0 4	,,	,,	5 0	21 0	1
7	Ma Hla ...	2 8	0 7½	0 9½	0 8½	2 11½	0 3½	0 3	0 3½	,,	,,	5 4	27 9	3
8	Ma Shwe ...	2 11	0 8	0 7½	0 6½	2 9	0 4	0 3½	0 3	,,	,,	5 0	23 3	2½
9	Ma Sein ...	3 0	0 8	0 10	0 8	2 8	0 1	0 4	0 4	,,	,,	5 0	21 0	1
10	Ma Shin ..	2 7	0 8	0 0	0 14	2 6	0 3	0 4	0 5	,,	,,	6 1	22 4	2

the lungs, spleen, brain and stomach. The African comes nearest the standard only in connection with the liver, while the Indian does so only with regard to the spleen, if Waddell's figures are excluded.

I should add that if one takes 5 ft. 4 in. as the average height for males for all classes, the weight corresponding to this height for a European is 139 lb., for a Burman 120 lb. and for an Indian 112 lb., so that the Burman weight again is more in harmony with the European standard than is the Indian. I regret I am unable to supply this information for the African.

(9) With regard to females, the Burman approaches the European standard most closely for the brain and heart; the African for the lungs, liver and kidneys; and the Indian with regard to the spleen.

(10) The spleen is the only organ in which the average weight of it for the Eastern races exceeds that of the European.

(11) To recapitulate the above, the general rule appears to be that the African holds the *maximum* weights, the Indian the *minimum* weights, and the Burman the *highest averages* for the organs. The African female holds the *maximum* weights and the *highest averages*, the Indian female, like the male, the *minimum* weights, and the Burman female lies between these extremes for all the organs.

(12) In conclusion, may I ask if the lengths of the intestines have any connection with appendicitis?—as I have already pointed out that the maximum lengths of the intestines in both Indians and Burmans exceed those of the Europeans by more than 2 ft. at least. It is well known that appendicitis is not so common in the East as it is in European countries. Is digestion carried on in a more satisfactory manner with a longer stomach and longer intestines?

AMŒBIC DYSENTERY.

By ANDREW DUNCAN, M.D., B.S.Lond., F.R.C.P., F.R.C.S.

J. S. F., aged 19, a Lieutenant in the Royal Navy, consulted me on September 16 for amœbic dysentery, from which he had been suffering for five months. During this time he had exhibited the feature of the disease, as described by Drs. Connathan and Lafleur in their classical paper in the Johns Hopkins Hospital Reports for 1891. No solid motion had passed for the five months, the dejecta being of a light brownish or greenish character, sometimes with blood, but more often the latter was absent. Exacerbation, followed by alleviation of the symptoms, occurred as the disease progressed. On July 1 he was in sick quarters on H.M.S. "Alexandria." After six weeks had elapsed, no improvement having set in, he was transferred to the hospital at Port Said, where he stayed for three weeks, and was then invalided home, as the symptoms had by this time practically disappeared. On the day of his landing in England, he again had a relapse, and was admitted into the Naval Hospital at Plymouth for a week, when the symptoms once more abated. He reached his home on September 4. The bowels now not having been opened for forty-eight hours, he was given some magnesia, which brought on once more the loose motion with mucus. This looseness was absent during the day, but always came on at night, the bowels being opened about four times each night. He had not had a normal solid motion for five months, when I first saw him. He had been treated for amœbic dysentery, according to the plan advocated in America, namely, with rectal injections; ipecacuanha was not administered.

As the rectal injections had not stayed the progress of the disease, I at first gave him Izal, which drug has been strongly advocated in India lately. This had no effect. After taking the Izal for nine days, I began treating him with 9 gr. doses of ipecacuanha twice daily. The effect at once was most striking. The motions gradually ceased, until October 10 he passed his first solid motion. Since this date he has had no more loose motions, but, on the contrary, a tendency to constipation. His personal appearance is very different to that present on his first visit to me, being now that of a boy in perfect health.

I think this case worthy of record for the following reasons: ***First***, the immediate cessation of the symptoms, after the somewhat lengthy course of

the disease, on the exhibition of ipecacuanha was most striking. *Secondly*, the case, with the practice of other physicians in England, would seem to show that the treatment of amœbic dysentery varies with the country in which the disease occurs, in the same way as the treatment of bacterial dysentery varies with the country in which it occurs. Thus, with regard to the latter, as is well known, ipecacuanha, which is so successful in India, was of scarcely any avail in South Africa. Sir Frederick Treves has informed me that it was given up, and the case treated by salines. Again, in South Africa, *Monsonia ovata* gave remarkably good results under Dr. Maberley; it was found to have no effect at the Branch Seamen's Hospital, Albert Docks. In Malay lavage of the intestine was found to have superior efficacy over ipecacuanha or salines.

Returning now to the treatment of the amœbic variety of the affection, the experience of American physicians has been, until recently, against any value to be obtained from ipecacuanha. Dr. Strong, in his very comprehensive article in Professor Sir Wm. Osler's "System of Medicine," states that local treatment by rectal injection of quinine and irrigation gives by far the most efficacious results. In the last edition of the "Principles and Practice of Medicine," by Osler, ipecacuanha is not mentioned in the treatment of this form of dysentery, but, like Strong, he holds quinine injection to be the best. In the beforementioned article of the Johns Hopkins Hospital Reports, quinine injection appears to have been followed by the most satisfactory results. Sir Patrick Manson, on the contrary, now holds ipecacuanha to be a specific for amœbic dysentery; in the early edition of his work on "Tropical Diseases," it would appear that he was not decided whether amœbæ really were the exciting cause of the disease. And in this view I for a long time agreed with him. During the whole of my service in India, I never saw a single case of amœbic dysentery; that is to say, dysentery showing a long course and with the evacuation similar to those described in the Johns Hopkins Hospital Reports. Nor have I ever seen the peculiar *post-mortem* results described by Leonard Rogers as occurring in cases of this disease in Bengal. Colonel Buchanan, that indefatigable investigator into tropical diseases in India, held that amœbæ were only concomitants. During the last year there have been, however, one or two cases reported in America of success obtained by ipecacuanha. How are we to explain these different results? The only explanation would seem to be that the type of the disease, as seen in America, differs from that seen in England.

Lastly, the term "amœbic," or tropical dysentery, has always seemed to me to be a misnomer, at any rate as regards India. The most frequent form of the disease, in fact, according to my experience, the only form of the disease, seen in the United Provinces and in the Punjab, has been bacterial dysentery. Professor Leonard Rogers states that this is the most frequent form in his experience. I do not know whether this be the case in other tropical regions, but if so, it would seem that tropical dysentery is more closely associated with bacteria than with amœbæ as a cause.

Rocky Mountain Spotted Fever.—The Bureau of Entomology of the United States Department of Agriculture has just issued a bulletin* on the control of Rocky Mountain spotted fever which is of interest to the medical profession, especially on account of the well-known work of the late Dr. H. T. Ricketts. This publication is Bulletin 105, entitled "The Rocky Mountain Spotted Fever Tick, with Special Reference to the Problem of its Control in the Bitter Root Valley in Montana."

It has become recognized that the control of at least the majority of insect-borne diseases involves an attack against the insects which transmit them. The results obtained by the Bureau of Entomology in the spotted fever work are of this kind. The control measures recommended, as the result of work in a camp laboratory in the infested territory, are thus similar to the procedure now being followed throughout the world in the control of malaria, yellow fever, and other insect-borne diseases.

It was determined from the investigations conducted in the Bitter Root Valley in Montana that the tick which transmits the disease in nature is practically restricted, as far as one stage, the adult, is concerned, to the larger domestic animals. In fact, the vast majority of the adult ticks develop on cattle and horses. The immature stages of the pathogenic tick develop on a large number of different species of rodents. The discovery that the adult stage engorges only on the larger animals, which was made originally by Dr. H. T. Ricketts and which has been much more firmly established by the recent work of the Bureau of Entomology, is the key to the plan of control that is recommended. It involves the dipping or hand treatment of the cattle and horses in the Bitter Root Valley in Montana for several months during the spring. The bulletin gives full details as to the procedure to be followed. In three years' time it is estimated that this plan will result in the practical extermination of the fever tick and thus in the eradication of spotted fever. It is estimated that the total cost of this work for the three years would be $23,692.

* "U.S. Department of Agriculture, Bureau of Entomology —Bulletin No. 105." L. O. Howard, Entomologist and Chief of Bureau. "The Rocky Mountain Spotted Fever Tick, with special reference to the problem of its control in the Bitter Root Valley in Montana." By W. D. Hunter (in charge of Southern Field Crop Insect Investigations) and F. C. Bishop, Entomological Assistant (in co-operation with the Biological Survey and the Montana Agricultural College). Issued November 17, 1911. Washington Government Printing Office, 1911.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JANUARY 15, 1912.

PROGRESS IN SLEEPING SICKNESS INVESTIGATIONS IN NYASALAND AND NORTH-EASTERN RHODESIA.

CONSIDERABLE progress has already been made in the investigations now being conducted in Nyasaland and North-Eastern Rhodesia to determine the etiology and epidemiology of the cases of trypanosomiasis that have recently been cropping up there in the absence of the special tsetse-fly, the *Glossina palpalis*. A wire received some little time ago from Dr. Kinghorn, in Rhodesia, stated that he (Dr. Kinghorn) had succeeded in passing the human trypanosome of these parts through *G. morsitans*, and had experimentally transmitted it to animals by the bites of this same insect; and if this has been done experimentally there does not seem to be any reason why it should not occur in Nature. If the latter should eventually prove to be true, then the matter will be largely settled, and the only further point of interest will be to prove whether or not the Rhodesian trypanosome is the same species as *T. gambiense*. In the event of its proving to be so there will necessarily exist the danger of *T. gambiense* spreading out of *palpalis* areas into *morsitans* ones, an eventuality fraught with the greatest danger to all human beings living in such areas; but, on the other hand, it is to be hoped that it will be proved to be a new species, with only *morsitans* as its carrier, for then it may be possible to confine it to the areas in which it has appeared. Whatever is decided eventually it is quite clear, even now, that the prophylaxis of a *morsitans* carried trypanosome must necessarily be much more difficult than a *palpalis* carried one, and it will tax the brains of the Commissions working at the subject to devise means of safe prevention for the inhabitants of the infected districts. Dr. Barclay, in the "Nyasaland Protectorate Sleeping Sickness Diary" for October, 1911, gives a synopsis of the work done up to date in Nyasaland. An interesting feature of his report is the description of an attempt to treat cases of sleeping sickness with Salvarsan or "606." The cases selected unfortunately were in advanced stages of the disease and were therefore not the most suitable for treatment, but be that as it may, the drug did not produce the slightest improvement and Dr. Barclay believes that for such cases it is useless. This is disappointing, but perhaps early cases of trypanosomiasis may be more amenable to it and extended trials are indicated before condemning it for good. In view of the successful experimental infection of six monkeys in Tanganyika by Taute, Dr. Barclay believes that it seems probable that *G. morsitans* is the vector for the trypanosome of the Nyasaland cases, whether that trypanosome be *T. rhodesiense* or *T. gambiense*, or the latter modified by a passage through game or through *G. morsitans* itself. Professor Newstead has successfully located the breeding places of this latter tsetse-fly in different parts of the Protectorate, and this knowledge will be of the greatest use when questions of prophylaxis have to be taken up later. The Royal Society Commission should have commenced work by now, and much is to be hoped for from their researches. Captain Hamerton had already arrived in October, according to Dr. Barclay, and had selected a site for the Laboratories on Kasu Hill, a mile west of Mvera Mission Station. This site would appear to be a very suitable one for the purposes of the Commission, as it is on the main road between Domira Bay and Dowa, which can be utilized by motor cars and bicycles. Again, it is central as regards the epidemic, and game and fly are plentiful in its vicinity. The hill itself is 4,740 ft. high, has a good water supply, and, as far as Nyasaland goes, is comparatively healthy. A branch from the main telegraph line at Dowa will be connected with the laboratories, and as the hill can be reached from Zomba in five days, there will be easy communication with headquarters when the Commissioners require it. Captain Hamerton was erecting the necessary buildings when Dr. Barclay's report went to press. The only difficulty there would seem to be is the comparatively small number of human cases and the wide area over which they are spread, but possibly these will be able to be collected into a hospital in close proximity to the Commissioners' Camp. The many and varied questions as regards

the part wild game play in the transmission of this new trypanosome to man will all have to be carefully worked out, and for this task no one better than Sir David Bruce and his coadjutors could be found. All interested in this branch of tropical medicine will look forward with eagerness to the first reports and work of the Rhodesian and Nyasaland Commissions. Their results mean everything to the future development of these large territories.

G. C. Low.

Annotations.

The Treatment of Tetanus.—Kintzing, of Baltimore, in the *New York Medical Journal* for December 23, 1911, describes a new treatment for tetanus, a treatment under which he personally had five consecutive recoveries, while two more cases in the charge of colleagues, treated in the same manner, also got better. There would certainly seem to be something more than coincidence in such a number of recoveries from a disease so deadly as tetanus.

The remedy employed was a solution of pure phenol of 10 per cent. strength, made by dissolving the deliquesced crystals in sterile water. This solution was then diluted to suit the case, generally to 30 or 40 minims, and administered by hypodermic injections deep into the muscles; the dose being repeated at intervals of three hours, in the beginning, increasing the interval as improvement manifested itself. The full adult dose employed was 10 drops of this 10 per cent. solution, equalling practically 1 gr. of pure crystalline phenol. As a precaution against soreness or suppuration, the author sometimes diluted with sterile water half the stated amount, 5 drops, to the capacity of a 25 or 30-minim syringe, and injected this into one buttock, following immediately with the remainder of the dose into the opposite buttock; the succeeding injection may be made into the deltoids or the pectoral muscles, if deemed advisable. However, when the entire dose, properly diluted (*i.e.*, to 40 minims), has been given in a single injection, no bad results follow. The dose employed in the second case was 5 minims; in the sixth case, 3½ minims, which was afterwards increased to 5 minims. In fully-developed cases the second dose is administered one hour after the first, the third being given after the lapse already stated.

The urine must be carefully watched, and if the characteristic smoky colour develops strongly Kintzing considers it a signal for temporary cessation of the injections, but he states that up to this time he has never been obliged to withdraw the remedy either for this or any other contra-indication. Naturally, the original wound should be excised or cauterized, preferably with strong solutions of carbolic acid, of silver nitrate, or of nitric acid.

During the time covered by four of these cases two patients with tetanus were treated surgically with antitoxin manufactered by an American firm, and both patients perished. Likewise the fifth case was first treated with the antitoxin without perceptible improvement; when, seemingly, he was in a fair way to succumb, the treatment was changed to phenol, whereupon the improvement was very prompt, and the ultimate outcome recovery.

In all of Kintzing's cases the disease was more or less protracted, the convulsions generally continuing some ten days; in the sixth case they ceased about the thirteenth day, and in one instance slight tonic seizures continued at intervals for thirty days, usually occurring not oftener than once daily. In every patient who came under observation the severity of the tonic convulsions diminished markedly with the successive injections. Sometimes the improvement was very apparent after the third or fourth dose, in that the number of attacks was lessened and their duration shortened. This was noted in the seventh case, and particularly in the sixth case, wherein, during the initial period, as many as twelve convulsions occurred in one hour. In three of the cases a diffuse, punctate, scarlatinal rash appeared, covering the trunk and portions of the extremities; whether due to the injections or not Kintzing is not prepared to say. In Case 6 it appeared a few hours after admission, but did not increase in severity with the progress of the treatment, and disappeared before the injections were finally discontinued.

Kintzing then discusses the different points that might explain the activity of the remedy, and states that Bacelli, in 1892, was the first to advocate carbolic as a remedy in tetanus (15 minims, 1 c.c., of a 1 per cent. solution). Tetanus is extremely prevalent in many parts of the Tropics, and its mortality is certainly no less than in temperate climates, so that anything that can hold out the slightest hope in its treatment should certainly be given an extended trial. Tropical readers of this annotation might therefore try carbolic acid when an opportunity presents itself, and by the collection of a large number of cases some definite opinion might be formed as to the value of this method of treatment. Antitoxin in the Tropics appears to be practically valueless.

Dysentery and Liver Abscess in Bombay.—In the *Scientific Memoirs by Officers of the Medical and Sanitary Departments of the Government of India*, No. 47 (new series), 1911, Major Greig and Captain Wells report on an inquiry they have carried out on Dysentery and Liver Abscess in Bombay. Their general conclusions are as follows: (1) That bacillary dysentery occurs in Bombay, but the incidence, so far as the authors' observations go, is low. (2) That dysentery associated with amœbæ is more prevalent. (3) That amœbæ can be cultivated from the stools of dysentery cases and the pus of liver

abscess cases and grown outside the human body on a suitable medium. (4) That the prevalence of amœbæ shows a marked seasonal variation. The curve of amœbic prevalence closely follows the humidity curve, and has no definite relationship to the temperature curve in Bombay. (5) That the season of greatest prevalence of amœbæ in Bombay corresponds to the season of greatest prevalence of dysentery, as shown by the admission rate for dysentery for ten years in the gaols of Bombay. (6) That the amœbæ cultivated from the stools of dysentery cases and pus of liver abscess cases are not *Entamœba histolytica* or *coli*, but are probably the same or similar forms to the amœbæ cultivated by Noc from dysentery and liver abscess cases in Cochin China. (7) That the same, or apparently the same, amœbæ can be cultivated from tap water. (8) That amœbæ can be cultivated from the stools of a large number of normal animals. (9) That the amœba forms cysts both inside and outside the body to resist conditions unfavourable to its life, and that the cystic stage is important both in regard to the treatment and prevention of the disease, and cases of dysentery should not be considered cured until the stools are found to be free from cysts. (10) That amœbæ may be cultivated from the fæces of a person suffering from abscess of the liver, although he at the time shows no sign of dysentery. (11) That the evidence at present available indicates that water is a channel by which amœbæ of dysentery may be disseminated in endemic areas. (12) That a high leucocytosis in cases of amœbic dysentery with an extensive lesion of the colon may occur. (13) That a moderate leucocytosis, with little alteration of the relative percentages, may occur in cases of slight amœbic dysentery, or in cases where, at the time of examination, no symptoms of dysentery exist. This, associated with rise of temperature, may indicate an early hepatic invasion by amœbæ; other signs of hepatitis may or may not be present at first, but sooner or later will develop, and, if not treated, may culminate in the grave complication of abscess of the liver. (14) That the administration of ipecacuanha in full doses, as pointed out by Major Rogers in the class of case referred to in the preceding paragraph (13) will produce a reduction to normal of the temperature and leucocyte curves and prevent the formation of liver abscess. (15) That the specific identity of the amœbæ which are demonstrable microscopically in the fresh stools with those appearing in cultures from the same material does not seem to be clearly established, and the interpretation of the results of cultivation of amœbæ from the fæces presents peculiar difficulties.

Radium in the Treatment of Tuberculosis.—Dr. S. Bernheim, of Paris, in a research on radium therapy for tuberculosis (XII French Medicinal Congress, Lyons, October 22 to 25, 1911), comes to the following conclusions:—

(1) It is possible to inject radium in very small doses into animals and also into the organism of human beings. For a long time after the injections the organic humours remain radio-active, and this radio-activity constitutes a real state of defence for the organism.

(2) With a special radium salt, the Dioradin discovered by Dr. de Szendeffy and Professor Béla Augustin, of Budapest, it has been possible to stop the progress of the infection in tuberculized animals. Even the most virulent cultures of the Koch bacilli have been stopped in their development by the influence of Dioradin.

(3) The result of different clinical experiments by Messrs. Danlos, Dominici, Degrais, and Wickham shows that different kinds of surgical tuberculosis have been cured by radium therapia.

(4) At the present time "Dioradin" used in a great number of hospitals and sanatoria for the treatment of phthisis, gives the best therapeutic results when the chemical composition is used under average circumstances.

(5) These average circumstances consist in injecting "Dioradin" into patients of the first and second degree, or even of the third degree, but to consumptive patients, whose organism is in a good state of resistance. It should be remarked that this composition, although very active, never causes local reaction nor general reaction.

(6) Injections of "Dioradin" are given by series of forty punctures. For patients slightly attacked one or two series suffice to stop the progress of phthisis. Tubercular patients severely attacked require from four to five series of punctures. But in any case, even those of a grave character, without cachexia, the treatment requires a much shorter time than that of a cure in a sanatorium.

(7) Out of the 160 tubercular patients cited in this work and taken at different degrees, and submitted to injections of "Dioradin" by different clinical surgeons, there were six deaths and four patients of the third degree where the treatment was ineffective. That is, ten failures out of 160 cases treated under the most unfavourable conditions. No therapeutic or hygienic method has ever produced such favourable and demonstrative statistics.

(8) In the course of this work Dr. Bernheim gives the reasons why serum coming from immunized animals has failed in the anti-bacillary treatment. For tuberculosis, as for syphilis, in view of this constant failure, recourse must be taken, he believes, to chemical compositions when they give certain and direct proofs of the action on the disease.

Malaria in England.—Indigenous cases of malaria in England are by no means common, but that genuine examples occur from time to time is now generally known. Some time ago a case that was described in the *Journal of the Royal Army Medical Corps*—a soldier at Aldershot—was noted in the JOURNAL OF TROPICAL MEDICINE AND HYGIENE, March 1, 1910, and now Captain Smallman, R.A.M.C., reports another similar case in the

same journal (*Journal of the Royal Army Medical Corps*, No. 5, November, 1911, vol. xvii). The history of the patient was as follows: Born at Hammersmith, twenty-one years ago, he left there as a child and went to Acton, where he resided until he came to Woolwich on enlistment. Apart from going back to Acton for one day, he never left Woolwich. It will be seen, therefore, from this history that he had never been out of England. On July 11, 1911, he complained of headache, and, when examined at the inspection-room, had a temperature of 105° F. Tongue was furred, there was some cough, and spleen was palpable. Enteric was suspected. The following morning there was a rigor, and, on a blood-film being examined, benign tertian parasites, in all stages from the ring form up to the fully-formed rosette, were found. Calomel and quinine quickly cut short the fever, and the patient has remained well since, with no further rises of temperature. Captain Smallman thinks that the infection must have been acquired at Woolwich. The patient did not remember having been bitten by mosquitoes. Regarding Captain Smallman's idea that malaria may spread widely throughout England again, this is not likely. Most of the English summers have not sufficiently high temperatures for development of the parasites in the mosquito's stomach, and the fact that one became infected this year (1911) depends, without doubt, on the excessive temperature prevailing last July.

Oriental Sore.—Dr. C. M. Wenyon, in a very interesting report on oriental sore in Bagdad,* summarizes his work in the following conclusions: (1) Oriental sore as it occurs in Bagdad does not differ essentially from that of other places—there may, however, be a variation in the virulence and duration of the oriental sore in different parts of the world. (2) The oriental sore attacks practically all natives of Bagdad generally between the ages of 1 and 3 years. Newcomers usually become infected within a year or two after arrival. (3) Occasionally individuals may escape infection, though exposed to it for years. (4) There may be one, two or three sores at one time. More rarely there are more. Sometimes there are as many as twenty-three and even greater numbers are talked of in Bagdad. (5) Whether single or multiple the oriental sore rarely appears on any but an exposed surface of the body, *e.g.*, face, fore-arm, leg, hand or foot. (6) One attack confers absolute immunity for the rest of life. It is possible that the sore of Aleppo may not produce absolute immunity against the sore of Bagdad, the same may be true of other places. (7) From inoculations from man to man it is demonstrated that the incubation period is about two months. (8) Inoculation with juice from a sore, as in vaccination against small-pox, produces a single sore at the point of inoculation only. From this it is concluded that in cases of multiple sore each sore is a separate inoculation by the transmitting agent or a sub-inoculation by a house-fly or by the individual himself. (9) There is a seasonal prevalence of the disease—though they may appear at any time of the year, sores most usually make their appearance during the months of September, October and November at the close of the hot season. (10) The duration of the disease is from twelve to eighteen months. (11) The sore commences as a small papule, which increases in size. It may then ulcerate and extend (female sore of Bagdad) or it may remain dry, with a scaly scab on the surface (male sore of Bagdad). There is little pain and no demonstrable constitutional disturbance associated with the disease. (12) In all true sores the typical parasite (*Leishmania tropica*) can be found, unless the sore is in the final healing stage. (13) He (Wenyon) has not been able to demonstrate the presence of the parasite in the peripheral blood either by direct examination of the blood or by the cultural method. (14) There is a much greater variety in the shape and size of the parasites in smears from the sore than in smears from the internal organs of cases of kala azar. (15) The parasites obtained from young sores are of the same shape, size and characters as those obtained from old healing ones. (16) He (Wenyon) has failed to demonstrate the presence of the sore in any domestic animal nor has the examination of one hundred and ten dogs revealed the presence of canine *Leishmaniasis* in Bagdad—kala azar in man is not known in Bagdad. (17) House-flies collected from the faces of children suffering from the open type of sore nearly always show the sore parasites in the gut—the parasites quickly degenerate and do not develop into flagellate forms. (18) House-flies must often act as mechanical carriers of the disease to open wounds. (19) Mosquitoes, *Stomoxys* and bed bugs fed upon the sore are found to take up parasites. (20) Only in *Stegomyia fasciata* and the bed bug do the parasites develop into *Herpetomonas* forms. This is, however, no evidence that these insects are the natural carriers of the disease. The same remark applies to the development in bed bugs of the parasites of kala azar described by Patton. Development probably takes place because of the large quantity of blood taken up acting as a culture medium. (21) The transmitting insect is probably sometimes the house-fly and more usually either one of the mosquitoes or the sand-fly (*Phlebotomus*). (22) The parasites of the sore develop into *Herpetomonas* forms in rabbit's or dog's blood agar, as previously demonstrated by Nicolle and Row. (23) The inoculation of dogs and other animals (not monkeys) with juice from a sore or artificial culture on blood agar has failed in Dr. Wenyon's hands to infect these animals. (24) No treatment has had much effect in reducing the duration of the sore. (25) Much can be done by protective inoculation on unexposed surfaces of the body not only to avoid the disfiguring scar on the face, but to prevent flies having access to sores and thus becoming infective to other people.

* "Oriental sore in Bagdad, together with observations on a gregarine in *Stegomyia fasciata*, the hæmogregarine of dogs and the flagellates of house-flies." By C. M. Wenyon, Protozoologist to the London School of Tropical Medicine (the report of the expedition sent to Mesopotamia in 1910, by the London School of Tropical Medicine), *Parasitology* vol. iv, No. 3, October 24, 1911. Cambridge, at the Unversity Press.

Abstract.

PRESIDENTIAL ADDRESS DELIVERED AT THE SECOND MEETING OF THE GENERAL MALARIA COMMITTEE, HELD AT BOMBAY ON NOVEMBER 16, 1911.

By Surgeon-General C. P. Lukis, M.D., F.R.C.S.

Acting Sanitary Commissioner with the Government of India.

In his opening remarks, Surgeon-General Lukis stated that the purpose of the present meeting was to ascertain what progress had been made since they met for the first time in Simla in November last, and to make suggestions which would facilitate further advance.

He said that the publication, *Paludism*, two numbers of which had been brought out during the last year, could not maintain its usefulness unless, in the future, they received from officers engaged in malarial operations far more contributions than had been received in the past.

He also spoke of the new Indian Research Fund with the aid of which they hoped to carry out many investigations which hitherto, for financial reasons, had been outside the bounds of practical politics. The first inquiry which would be undertaken at the expense of this fund had already been commenced, namely, an inquiry into the methods by which yellow fever might be prevented from entering the Indian ports, and might be stamped out should it ever succeed in obtaining a footing.

The danger of its introduction which might arise on the opening of the Panama Canal had recently engaged the serious attention of the Government of India, and it had been decided, in consultation with the Right Honourable the Secretary of State for India, to depute Major James to the endemic area by way of the route which would be followed by ships proceeding to India when the Canal was opened.

There were two other inquiries of importance. The first was the institution of malariometric investigations, for which work the central committee considered it desirable to have at least one worker who could devote his whole time to the development of malariometric methods and their application to the study of Indian malaria. The second was an inquiry into the bionomics of anopheles.

Two very important contributions to our knowledge had been made during the past year. The first was the publication of Dr. Bentley's admirable report on the causes of the recent malarial outbreak in Bombay, which had confirmed Major Liston's original observations incriminating *Neocellia Stephensi* as the carrier of malaria in that city; and which suggested that malaria could not only be reduced, but could be absolutely eradicated from the greater part of Bombay at a cost which would amount to less than a tenth part of the loss estimated to be occasioned each year by the disease. The second contribution was a report which had just reached him from Major Carruthers, who was sent to investigate the causes of malaria in the Andamans. The first thing that struck him was the remarkable fact that a large number of villages were quite free from malaria, in spite of the fact that many of them were surrounded by riceland, swamp or jungle, whereas others showed a considerable amount of malaria, the spleen rate varying from 25 per cent. to 50 per cent. Eventually it was noted that what determined the healthiness or unhealthiness of a village was its proximity to the sea. Villages near the sea were invariably malarious; those remote from the sea healthy. Even a distance of half a mile from the sea was sufficient to ensure the endemic index being 0 per cent. This distribution of malaria was shown by actual measurement to be exactly coincident with the occurrence of a particular species of anopheles, namely, *Pseudomyzomyia Ludlowi*, which appeared to breed chiefly in salt swamps and brackish water, and which was undoubtedly the chief malaria carrier in the Port Blair Settlement.

Now so closely does this mosquito, on casual examination, resemble *M. Rossii* that, with reference to these two species, Professor Eysel has remarked upon the folly of too nice distinctions in regard to the species of anopheles and the transmission of malaria. Yet the existence of two distinct, though closely related, species of anopheles is the explanation why, in the Andamans, the proximity to ricelands and swamps is innocuous, provided that these are at a distance from the sea.

The President next viewed with concern the tendency amongst malaria workers to divide up into two camps, namely, those who advocate anti-mosquito measures and those who pin their faith on quinine prophylaxis. Quinine prophylaxis should go hand in hand with general sanitation and with the destruction of anopheles breeding grounds wherever this could be accomplished at reasonable expense, and it seemed to him that recent observations justified them in thinking that this destruction was not likely to be as costly as had hitherto been supposed. Quinine had undoubtedly conferred inestimable benefits upon the individual; but it never had, and never would, be of equal value to the community as a whole, and one could not get away from the fact that if there were no mosquitos there could be no malaria.

Two classes of men were required—the scientific experts and the practical workers—the former engaged in research and ready to aid the latter when in difficulties—and the latter trained in the taking of spleen indices and in the recognition of the commoner varieties of anopheles. It was not necessary that they should be able to dissect them.

Surgeon-General Lukis then alluded to the diseases allied to malaria, especially those of the "Leishmania" type. There were, he said, several points in connection with these which required further investigation.

The genus Leishmania at present comprised three species:—

L. Donovani—the parasite of kala azar.

L. tropica—the parasite of Oriental sore.

L. infantum—the parasite of infantile splenomegaly in North Africa.

The points in connection with these, which in his opinion required further investigation, were as follows:—

(1) *The Rôle of the Domestic Fly as a Carrier of Oriental Sore.*—Both Wenyon, as the result of his work in Baghdad, and Row, in India, regarded this insect as the carrier. On the other hand, Patton, as the result of his recent observations in Cambay, was inclined to incriminate the bed bug. Further investigations on this point were clearly necessary.

(2) *The Question of the Carrier of Kala Azar.*—It was generally supposed, though it was by no means proven, that the bed bug was the carrier in this case. On the other hand, Nicolle regarded the dog as the reservoir of the parasite which caused the infantile kala azar of North Africa, and both he and Basile had proved that the parasite was carried from dog to dog by the dog-flea, and he suggested the possibility that it might be conveyed from dog to man by the same means. So far, dogs in India had not been found to be infected with *L. Donovani*, and all attempts to infect dogs with it had failed, but a much more extensive examination of dogs in kala azar districts in India would seem to be indicated.

Review.

THE ANOPHELINE MOSQUITO, SOME FACTS AND INFORMATION FOR USE IN SCHOOLS. By R. C. Dauglish. With illustrations. London: John Murray, Albemarle Street, 1911. 6d. net cash.

There is no doubt that judicious teaching in the schools of the Tropics and sub-Tropics will furnish the rising generations of children with many of the simple facts of elementary sanitation, and for this purpose suitable text-books will be required. One has no hesitation in saying that the "Anopheline Mosquito" by Mrs. R. C. Dauglish is eminently a text-book suitable for the above purposes and one that should be in the hands of all young scholars throughout the world. The little primer was written for a society known by the name of the Barberton Anti-malarial Association, formed in Barberton, in the Transvaal, to fight malaria. At one of the early meetings of this Association it was decided to make an effort to introduce the teaching of the subject in the schools as the best step towards spreading knowledge of the simple facts relating to malarial fever, and the Chairman invited Mrs. Dauglish to write a little book on the subject. The result as already mentioned has been most satisfactory. The text contains just what is required and photographs help to explain the points: no harm would have been done if a few more of these had been included. The work should undoubtedly meet the end for which it was intended, and it may be heartily recommended for use in all elementary schools in the Tropics.

Notices.

"KALA AZAR BULLETIN."

THE first number of the newly-founded bulletin for Kala Azar appeared last month (December, 1911). It is being issued under the direction of the Honorary Managing Committee of the Sleeping Sickness Bureau, and has as its editor Dr. C. M. Wenyon, M.B., B.S., B.Sc., Protozoologist to the London School of Tropical Medicine. The formation of such a bulletin will be useful, as the work that has been and is being done on Kala Azar and allied subjects is now very great, and, correspondingly, the literature is not always easy to obtain.

The contents of the first number are as follows: Experimental Kala Azar in Animals; Spontaneous Canine Leishmaniasis; Experiments on the Transmission of Kala Azar by Blood-sucking Arthropods; Experimental Work on Oriental Sore; The Culture of *Leishmania tropica;* Dermal Leishmaniasis in Egypt, the Sudan, and the Niger Territory; Quarterly List of References. Before the appearance of this number Dr. Bagshawe published a list of references on Kala Azar as an introduction, this list containing some 900 titles of publications on Kala Azar—Infantile splenic anæmia (Infantile Kala-Azar ponos) and Oriental sore; that is, those affections which are at present known to be caused by *Leishmania*. This, in conjunction with future numbers of the bulletin, which are to appear quarterly, will be found, as already said, to be very useful to those specially interested in this branch of tropical medicine.

THE "JOURNAL OF THE LONDON SCHOOL OF TROPICAL MEDICINE."

The first number of this journal also appeared last month (December, 1911). Sir Patrick Manson, the editor-in-chief, explains the scope of the publication in his "Foreword." He states that it is proposed as a commencement to make one issue of the journal about the middle of each session—that is, three numbers a year, and to limit each number to about one hundred pages. Additional matter of importance, if too long for publication in the body of the journal, such as special reports by commissioners of the school, will appear as a supplement or supplements. The various articles will be arranged under the headings of Clinical Medicine, Pathology, Bacteriology and Hygiene, General Medical Zoology, Protozoology, and Helminthology, and the teachers of these several departments will take charge of their respective sections, subject to such editing as considerations of space and illustration may make necessary.

The present number contains some very interesting papers on helminthology, bacteriology, and other subjects, a further interesting feature being the annotating of recent literature bearing on tropical

diseases. This should be found to be of value, especially to students abroad who cannot readily obtain the literature on any given subject. A want has been felt for some time past at the School for such a journal, and now it has been started it should go on uninterruptedly and should be a great success.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"Report of the Department of Sanitation of the Isthmian Canal Commission," October, 1911.

The Health of the Isthmian Canal.—Major Gorgas in his monthly report on the health of the Isthmian Canal workers states that: Among employees, during the month of October, the deaths from the principal diseases were as follows: Chronic nephritis, 3; dysentery, clinical, 1; hæmoglobinuric fever, 1; lobar pneumonia, 13; malaria, 1; tuberculosis, 6; leaving 13 deaths from all other diseases, and 8 deaths from external violence.

The number of deaths from pneumonia have occurred almost exclusively among coloured labourers recently brought to the zone from the West Indies, as was the case in 1906 when an epidemic of the same disease prevailed.

No cases of yellow fever, small-pox, or plague originated on the Isthmus during the month. One case of bubonic plague of the septicæmic variety, from Guayaquil, died at Ancon Hospital on October 17. The case was interesting in that it revealed no external lesions of the disease, and was diagnosed at autopsy from smears taken from the spleen and femoral glands.

"Journal of the Royal Army Medical Corps," No. 6, December, 1911, vol. xvii.

The Treatment of Syphilis.—Harrison, in a paper on "A Comparison between Syphilis Relapses under Mercurial and Salvarsan Treatment Respectively," concludes: (1) That salvarsan has a more intensely specific action than mercury. (2) That, even if a relapse does occur, as the patient's tissues have been free from the action of the spirochætes for the greater part of the interval, other things being equal, his health should be better than that of the patient who is treated with mercury only. (3) That, if subsequent events justify the hope that a salvarsan-resistant strain of *S. pallida* is not produced by repeated injections, it should be possible to prevent patients who are still in the very early stages of syphilis from developing symptoms of a later type. To accomplish this, however, it would be necessary to watch each patient carefully, especially with regard to his Wassermann reaction, and to repeat the treatment on the least indication of the latter returning to positive.

"The Journal of the American Medical Association," vol lvii., No 23, December 2, 1911.

Balantidium coli.—Bowman contributes an interesting article on the pathogenesis of the *Balantidium coli*. As he says during the past decade this parasite has been attracting much attention in respect both to its pathogenicity and to its life-history. It has chiefly been studied in Manila. Bowman states that it is unknown whether a break or abrasion in the mucosa of the intestine is necessary for the entrance of the *Balantidium*, or whether it can force its way through the lining membrane by purely mechanical means or whether a cytolytic ferment is liberated. Once it has entered its progress is limited only by the length of the colon. The parasite, he states, though not so widespread as the amœba, in individual cases is equally serious in its effects. It does not live in the intestine in a state of harmless commensalism, but causes a dysentery which in its late stages is not amenable to medication and usually results in death

"New York Medical Journal," December, 16, 1911.

Ipecacuanha in Dysentery.—Dudley Roberts, writing on the influence of ipecacuanha upon intestinal amœbiasis, concludes that, although many treatments have been suggested for amœbic dysentery, it is his opinion, from the study of the literature and his personal observation, that ipecacuanha is the only remedy that can lay claim to being specific. That it is specific has been questioned by many competent observers, but their criticisms are to a large extent answerable. Until large doses were made possible by careful preparation of the pills, it was not possible to secure results except in those patients who could tolerate powerful emetics. In very old cases of amœbic dysentery it is also possible that structural changes in the wall of the bowel are of such a deep nature that perfect anatomical cure cannot take place. It is again possible that these areas are infected with micro-organisms not affected by ipecacuanha treatment. Just how frequently either may prove to be the case will be determined by future experience in those districts where the disease is most common.

Reinfection at the point of least resistance in the bowel is always a thing that must be taken into consideration.

"The Journal of the American Medical Association," December 16, 1911.

Preparation of Hæmatoxylin Stain.—Johnston, of the University of Georgia, points out, that by the usual methods of preparing hæmatoxylin stain, one is compelled to wait several days or longer for the stain to ripen. The following formula according to Johnston successfully eliminates these difficulties.

Hæmatoxylin crystals	1 grm.	A
Alcohol	10 c.c.	A
Alum	10 grm.	B
Distilled water	200 c.c.	B
Hydrogen peroxide, q.s.		

The hæmatoxylin crystals are thoroughly pulverized in a mortar and the alcohol added; the alum is dissolved in the distilled water. A is then added slowly with constant stirring to B. When well mixed, hydrogen peroxide is added drop by drop till the colour changes to a deep purple. After filtering, the stain is ready for immediate use. The only advantage of this method is the rapidity of preparation. The entire time consumed in preparing a stain ready for instant use is about seven minutes, as compared with several days of ripening by the older methods.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

A REVIEW OF THE POSSIBLE ETIOLOGICAL FACTORS IN MALARIAL RECURRENCES: THE SIGNIFICANCE OF SUCH CASES, AND THEIR TREATMENT.

By Graham E. Henson, M.D.

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I think it may be said that our knowledge of malaria, the mode of transmission, prophylaxis, and treatment, together with that of the morphology of the plasmodia, may be considered fairly complete, with the exception of that pertaining to the etiology of recurrences. In reviewing the literature on this phase of the disease, one is impressed with the diametrically opposed views held by the various authorities, all of which are entitled to consideration.

The theories advanced in the past have not been many, and in recent years have been limited to the following:—

Parthenogenesis; or the reproduction of the organisms by unfertilized macrogametes;

Intracorpuscular conjugation, this being a process in which the young hyaline forms effect union with each other inside the corpuscle, resulting in a resting body, a resistant form capable of assuming a zygote stage, multiplying after periods of quiescence and only then giving clinical evidence of their presence;

Asexual reproduction by schizogony, this reproduction taking place continually from the time of infection, and continuing after the subsidence of clinical symptoms, but then in numbers insufficient to produce clinical symptoms excepting under certain unknown conditions, when activity is resumed.

Parthenogenesis.

In 1903 Schaudinn [1] advanced the theory that the macrogametes took on a parthenogenetic cycle, that is, were able to multiply without fertilization by the microgametes, and attributed to this cycle recurring infections. Several other investigators had previously described sporulating gametes, but had not attributed to the cycle the significance that this author did, and while the theory may appear to be a reasonable one, it has not been generally accepted. Deaderick [2] has subscribed to it, but offers no evidence in its support except to cite the case of Frau Kossel, reported by Schaudinn, in which it is claimed an alteration of the species was observed. Ross [3] criticizes the deductions drawn from this case, calling attention to the fact that during the period this patient was under observation the gametes varied in number, and that while there was a marked increase in their numbers the day before a paroxysm, considers that there was no evidence that they were not produced from ordinary spores, but that their variation in numbers itself suggests that they were being produced all the time, and that the source of asexual spores from which he considers they were derived were too few to be detected by the method used. He calls attention to the fact that the cells were not actually observed in the process of development, but that it was inferred such development took place from a study of different cells in what was considered different stages of evolution. Deaderick [4], however, in following his line of argument in support of the theory, states that "these relapses at long intervals can be explained by parthenogenesis alone. After the schizonts have perished, while the microgametocytes do not persist long, the macrogametes remain for indefinite periods." In discussing a similar claim made by Schaudinn in the benign tertian infections, Craig [5] does not confirm this statement in connection with æstivo-autumnal infections, claiming that the male and female gametes remain in the blood for weeks after acute clinical evidence has passed away, and in practically the same ratio during the periods of observation. This has also been my experience in the æstivo-autumnal infections seen in Florida.

In an address before the Liverpool School of Tropical Medicine, Ross [6] stated that many of their cases suffering from relapses never showed any of the sexual forms, thus indicating that they are not a factor in this form of the disease. He and Thomson [7], in a series of cases, record in several of them a marked rise in the curve of sexual parasites, unaccompanied by any rise of temperature. In one case the gametes reached the high number of 1,500 per c.mm., remaining over a thousand for nine days, during which time there was no elevation of temperature notwithstanding the fact that no antimalarial treatment was instituted. With these cases in mind, it is hard to associate recurring malarial infections with the theory of sporulating gametes. If such phenomenon resulted in recurrences, why is there no elevation of temperature in these cases showing a marked increase in the gametes and unhampered by treatment of any kind? To gather the full significance of this objection to the theory it is necessary to dwell on the etiology of fever in malaria. There have been many theories, but the one advanced by Baccelli [8] in which he claims that the fever is produced as a result of toxins liberated at the time of sporulation, being generated in the corpuscles during the growth of the plasmodia, is now generally accepted. With this fact established, is it not reasonable to infer that if the sporulation of gametes, if such does occur, were a factor in recurrences, an increase of their numbers to any extent would be accompanied by an elevation of temperature? While it may be hard to reject what such an authority as Schaudinn reports as a positive finding, we cannot ignore the significant statement made by Thomson [9] that the phenomenon has never been observed by workers in the Liverpool School of Tropical Medicine, and "must be very rare, as it would otherwise have been noticed more often."

* Read before the Section on Medicine of the Southern Medical Association, Hattiesburg, Mississippi, U.S.A., November 14-15, 1911.

If it is necessary to adduce further evidence that the sexual forms are not a factor in recurrent infections, it would seem that the question could be absolutely settled by inoculation experiments with blood containing only those forms. Ross [10] cites four such experiments, one conducted by Thayer in 1898, and three by Elting in 1899. All of these were negative, three of them showing neither fever nor parasites at any time, whilst the other case had a slight rise of temperature two and six days after inoculation, but never showed any parasites. While these four cases may be considered as insufficient for final and conclusive laboratory evidence on which to reject the theory of parthenogenesis, they are of great significance, and together with the fact that Schaudinn's original deductions were based on a single case of benign tertian, and that all later evidence brought forward in support of the theory has been almost universally rejected, renders parthenogenetic forms (the very existence of which is a matter of great doubt) as being a factor in recurrences unlikely.

Intracorpuscular Conjugation.

The phenomenon of intracorpuscular conjugation of the young hyaline parasites was first observed by Mannaberg [11], and later described by Ewing [12, 13]. Neither of these writers attributed to it the significance it deserves, and it was Craig [14] who first described in detail the process of development and attributed to the resulting bodies the significance of their being a factor in recurrences, and he has since amplified the findings made in his original report by many additional contributions. I shall not take the time to go into the details of this form of the evolution of the parasite in man, but will refer those interested to the many excellent contributions that the author of this theory has published.*

Darling [15] has confirmed the findings of Craig, saying "the theories of Mannaberg and Craig explain the persistence of latent malaria by the process of conjugation of two ring forms within a red blood corpuscle." He also reports having frequently seen crescent bodies in latent æstivo-autumnal infections which he considered had been formed by the conjugation of two ring forms. While crescents and the sexual forms of the other types of the infection may be formed as a result of this process, I do not consider that these bodies have any significance in recurrences, or that the sexual forms have any other function than the perpetuation of the species when transferred to the mosquito. James [16] also has confirmed Craig's observations on the formation of these bodies in an æstivo-autumnal infection, and I have in another contribution [17] reported my findings in both the benign tertian and the æstivo-autumnal infections. Other writers have described the process, but in doing so have attributed the bodies as being due to parthenogenesis. Thus in Schaudinn's case, which I have already discussed, it is held by many authorities that he mistook the bodies resulting from conjugation for parthenogenetic forms. Neeb [18] in a recent publication, in which he upholds the theory of parthenogenesis, gives the following description of his observations on the ring forms of an æstivo-autumnal infection. "In the infected chromocytes one or occasionally two tropica-rings were generally to be found as a rule full grown, which, however, possessed the peculiarity that most of them contained one very large, and some of them a double chromatic mass, whilst the protoplasmic ring was proportionately very broad and coarse." He concludes "that many of them are to be considered as young gametes—future crescent bodies." This is, in a certain measure, such a good description of conjugating bodies in the process of formation, that it is hard to see why the description is made in support of parthenogenesis. I consider that, without subscribing to the fact, this writer confirms the original deductions of Craig.

I recently had under observation a case of considerable significance toward the verification of conjugating bodies. The patient had been unwell, complaining of a general malaise for some weeks, but showed no clinical symptoms; following routine procedure his blood was examined for plasmodia. Several smears at intervals covering a period of three weeks failed to reveal the parasite in any of its forms, but at the end of this time several parasites of a ring form, showing unsually large chromatin masses, with the protoplasm also larger than usual and staining an intense blue, were observed. The patient had never had malaria previously. He lived some miles from my home, and I wrote him predicting an attack of malaria, which had developed by the time my letter reached him. He was at once put on 30 gr. of quinine sulphate per diem, but, contrary to the usual result, while the fever disappeared, the same organisms were present in the peripheral blood for several days and proved very resistant to treatment. I did not observe forms in any advanced stage of development, but am satisfied that what I did see were the result of conjugation. Craig [19] has stated that intracorpuscular conjugation never occurs during the first few days of an acute malarial infection, and that on this account it is not seen in initial attacks. The case referred to would indicate that in persons possessing a relative immunity the process may take place even before clinical symptoms of the infection are present, and is still another reason why we should arrive at a diagnosis of these infections as early as possible.

While the different stages of development up to the form of what is considered by Craig to be the pre-sporulating stage have been carefully studied by this author, we have as yet no laboratory evidence that these bodies result in recurrences, and while without such evidence it is impossible to absolutely

* These have been many, but I would especially call attention to the very excellent monograph published by Doctor Craig in the *Journal of Infectious Diseases*, Chicago, vol. vii, No. 2, March 1, 1910, pp. 300-318, entitled "Studies in the Morphology of Malarial Plasmodia after the Administration of Quinine, and in Intracorpuscular Conjugation."

fix their significance, I feel confident that they will be proven to be the factor in relapses of long interval.

Asexual Reproduction by Schizogony.

It has heretofore been thought that the asexual forms disappeared from the peripheral circulation in the long intervals between clinical manifestations of the infection. Ross and Thomson [20] have recently shown that this is incorrect, and that the error was due to imperfect methods for their detection. In conducting some enumerative studies of the disease by the application of the thick film method, they show in a series of cases, by daily counts, that the asexual forms become less and less after an acute clinical manifestation of the disease, sometimes for a few days being zero, and from that to four or five per c.mm., but in many of these cases, although for a few days the parasites cannot be detected, they then slowly increase, giving clinical evidence of their presence only after reaching some hundreds per c.mm. With this demonstration arises the very important question: How long can schizogony continue without giving rise to clinical symptoms, and is it a factor in recurrences of long interval?

The almost universal opposition to the acceptance of this theory has been that it was unreasonable to infer that schizogony could go on for weeks, months, and sometimes for years, sufficiently to maintain the infection, but within such limits as to shut out clinical symptoms for long periods of time. Deaderick [21], in discussing this phase, says: "While it is probable that brief periods of latency may be thus explained, especially in persons possessing a relative immunity, it is evident that this is not the common mode particularly of relapses of long intervals, since the asexual cycle is known to wear out spontaneously after certain periods." Craig [22] takes a similar position, saying: "It is impossible to believe that the plasmodia of malaria continue to grow and multiply for weeks and even months, within the body of man without becoming numerous enough to produce clinical symptoms." He, however, reports having demonstrated parasites in the spleen of patients dying from other disease, and in whom there had been at no time clinical manifestations of malaria. He states that the plasmodia in these cases did not differ from that observed in the peripheral blood, and were undergoing normal schizogony. It would be interesting to know the probable time of infection in those cases, which is not stated.

Ross [23], who upholds this theory, which he says he "will continue to adopt until a better one is established," in replying to the argument advanced that it is unreasonable to think that the asexual forms can multiply for long periods of time without giving rise to symptoms, but sufficient to maintain the infection, writes: "It is impossible to accept such a train of thought. If 150,000,000 sporids cause but a little fever in a man of medium weight, 1,000 or 100 should cause none at all, and yet will be quite sufficient to keep the infection alive in him. But if the parasites are so few, what chance has the medical man of finding a single one? If even 1,000 parasites are present in a man of 10 st. weight, the chances are that we must search 15,000,000 hæmatids before we find one parasite. At the rate of 10,000 hæmatids a minute, we shall have to search for 1,500,000 minutes, or for twelve hours a day for more than five years, before we succeed." These figures, to say the least, strikingly demonstrate the likelihood of negative findings in positive cases.

Now it is very evident that there is a factor, at present undetermined, which is either responsible for the resumed activity of malarial plasmodia in man after periods of latency more or less prolonged, or checks activity for these periods. Is it possible that this factor is enough to prohibit the multiplication of the parasites to a number sufficient to produce clinical symptoms. May it not be the same factor, also as yet unknown, that in untreated cases, by the production in the blood of some antitoxic substance, prevents the continued multiplication of the parasites to the point that would mean death in every instance. Ross [24] considers that the rallies (a term he has applied to the intervals between clinical manifestations) "are probably due to a great destruction of the parasites by some germicidal power of the blood, or of their toxin by some antitoxic power, or more generally to both. And the relapses are probably due to decrease in both of these factors of resistance."

Significance of Recurrences and their Treatment.

The significance of a recurring malarial infection lies in the fact that such recurrence is *prima facie* evidence that the original infection was not properly treated, and that these patients are not only chronic sufferers of a greater or lesser degree, but in addition are a constant menace to the community in which they reside. Just so long as the infection is present, the formation of gametes is a possibility, and just so long are these people capable of transmitting the infection to uninfected mosquitoes, which in turn perpetuate the disease in man.

The absence of relapsing cases would mean that all first infections were receiving proper treatment, the neglect of which at the present time is a leading factor in the present endemic index of the disease. Craig [25] states that a great deal of the malaria prevalent in every malarial locality is directly traceable to improperly treated cases, and the prophylaxis of the disease will be immensely helped by the thorough treatment of every infection. He most rightly states that "the practice of regarding such infections as cured because the active symptoms of the disease have disappeared is a most common and a most pernicious one, and one that is responsible for the transmission of a very large proportion of malarial disease." Harris [26] states as his opinion that "there would be but little chronic malaria if the acute cases were cured, but there are to-day probably two or three million persons in the United States who are harbouring malarial parasites."

It has been proven beyond any doubt that the

sexual forms require the mosquito as an intermediate host, and that only after a certain period following the ingestion of blood containing these forms is the insect capable of transmitting the disease. While the sexual forms do not appear in all cases, whether treated or not, there is plenty of evidence showing that early and efficient treatment arrests the development of gametes by the early destruction of their source of supply. Not only this, but with the knowledge that intracorpuscular conjugation takes place only in the young hyaline ring forms; if these are early destroyed the possibility of the formation of conjugating bodies is removed. The treatment of latent malaria should therefore be largely prophylactic, and consists of the treatment of the acute stage to a point where the infection is entirely destroyed, and if this is consistently carried out will have an immense effect in eliminating the infection.

We have evidence that, contrary to former opinion, the sexual forms can be eliminated from man by continued cinchonization. Darling [27] was the first to demonstrate this fact, which is no doubt effected by the destruction of their source of supply more than to the direct action of quinine on the forms themselves. The effect of quinine on the formation of gametes is shown by Thomson [28], who reports his observation on a case in which he shows that the first paroxysm with 50,000 asexual spores per c.mm. resulted in 850 crescents per c.mm. Twenty grains of quinine was given during this paroxysm, but no more was given for several days before or after it. The next paroxysm where no quinine was given until the day after produced 468 crescents per c.mm., and the next only 344 from 54,000 of the asexual forms per c.mm. At this period 30 gr. of quinine were given daily, a later relapse gave only 4 crescents per c.mm. from asexual spores numbering 16,000 per c.mm.

In the æstivo-autumnal infections 10 gr. of quinine sulphate three times daily for a period of from two to three weeks results in the complete sterilization of the blood, while the dose in the benign tertian and quartan infections can be reduced to 20 gr. per day. Tonics with the view of reconstructing the blood, such as arsenic and iron, should be employed where there is evidence of anæmia, which is general in all old infections. Skinner and Carson [29] report recently on the efficacy of the application of X-rays, claiming that the splenic pain is relieved and the engorgement of this organ reduced if of recent origin. They report that in cases where quinine was not well tolerated the drug was withdrawn and the rays applied, resulting in the clinical symptoms and parasites disappearing, and that they did not have relapses up to the time of writing. The application is, however, not practical where the greatest number of cases have to be treated in rural communities and a static machine unavailable. The use of salvarsan has, by some of the enthusiastic users of this drug, been heralded as a panacea for many infections, including malaria. I see no excuse for the administration in malaria of a drug which, it must be admitted, has an element of danger, when we have as comparatively safe a specific for the disease as quinine. Methylene-blue, advocated for many years by a few observers in the treatment of old infections, has lately been given a fresh impetus by the studies of Thomson [30]. Surveyor [31] writes on the efficacy of picric acid in crescent infections. He reports results obtained in 22 cases, and used as control to this treatment quinine alone in 34 additional ones. His results were very gratifying.

It having been proven that efficient treatment results in the death of the sexual forms, it becomes very necessary that we should have some practical method whereby we can ascertain when these forms disappear, and the case can be considered as cured. Ross [32], in 1903, introduced what is known as the thick film method. By decolorizing a thick smear of blood and staining the remaining film, one is enabled to examine a very much larger quantity of blood than can be examined with a thin smear, and to do it in a much shorter time. James [33] recently reported a modification of the technique suggested by Ross, in which he decolorizes the smear with an acidified alcohol, afterwards washing the film a sufficient time to insure the removal of all traces of the acid, and then stains. An objection to his technique is the time involved, while certain criticisms made on the Ross technique do not seem to be well grounded. I have adopted a modified technique for which I claim a considerable saving of time, which is of paramount significance to the busy practitioner doing his own microscopical work, as well as to the laboratory worker.

The technique is as follows:—

Two or three large drops of blood are spread over a square inch of the slide, allowed to dry and then immersed in a 5 per cent. solution of acetic acid for from one half to two minutes, depending on the thickness of the smear, or long enough to remove the hæmoglobin, then washed in a 95 per cent. ethyl alcohol for a few seconds, rinsed in distilled water, covered with a 2 per cent. solution of soda bicarbonate for twenty seconds, washed in water, then in alcohol and, without drying, stained. For this purpose I have used Wright's, but in adding the water it is necessary that the dilution be greater than is used when working with a thin smear. The entire process, including the staining, is completed in a little over five minutes. Only such ingredients as are chemically pure should be used, including in all instances distilled water, and it is imperative that the acid should be neutralized or the protoplasm of the parasites will not take the blue stain. It is also important that the alkali should not be in excess, or the film will take an intense stain from the methylene-blue, which cannot be sufficiently washed out without also decolorizing the parasites. Of course, in this method, as in all thick film methods, the relation of the parasite to the corpuscle is lost, making the identification of the parasites more difficult to one not perfectly familiar with the picture. I may be at variance with most authorities in considering the treatment of the disease the most potent instrument in our hands for its final eradi-

cation. With the elimination of gamete carriers, the presence of anopheles becomes harmless. Time does not permit a discussion of the situation from an economic standpoint, but with the co-operation of the laity, it appears to me that it should be more economical to treat all cases a sufficient time to destroy the sexual forms, than the almost endless task that confronts us in some localities in considering the destruction of mosquitos. I can say from personal experience that the education of the laity is not such a hard task as it is thought to be. I have made many converts to the cause of individual prophylaxis amongst all classes in my practice, among whom are included some of the most ignorant negroes.

Conclusions.

Parthenogenesis cannot be considered a factor in recurrences for the following reasons:—

(1) The very existence of such a phenomenon is a matter of great doubt, many observers working over a period of years having failed to demonstrate such forms.

(2) There are many cases reported that have at no time during the infection shown the sexual forms, but have frequently relapsed.

(3) The four cases cited by Ross in which inoculation experiments containing only sexual forms, failed in each instance to produce clinical symptoms of malaria, or to reveal the presence of any plasmodia, while in 51 cases cited by the same author inoculation experiments containing the asexual parasites in every instance produced clinical symptoms of the infection, and parasites of the type inoculated were demonstrated in all of the cases experimented with since the discovery of the plasmodia.

Intracorpuscular conjugation is not an occasional phenomenon, but is generally present in recurring cases. In persons possessing a relative immunity, which permits the parasites to remain in the blood in small numbers for some time before original manifestations of the infection, conjugating bodies may occur early in the infection. The observations of Craig that certain forms of the plasmodia exist only when conjugation is present, and often before gametes have appeared, would indicate that they are a factor in recurrences of long interval, and while they have only been followed by him to a presporulating stage, and further observations on their morphology are necessary to absolutely associate them with recurrences, there is good reason to believe that such studies will establish them as the etiological factor in long interval relapses.

Asexual reproduction by schizogony is generally accepted as the cause of short interval relapses, but the length of time that the schizont is capable of keeping the infection alive in man without producing clinical symptoms is at present undetermined, and can be only determined by future laboratory observations on an extensive scale.

The acceptance of either or both factors in the etiology is of biological interest, but whichever is the cause of recurrences, the solving of the problem from the standpoint of the sanitarian lies in the early diagnosis of all primary infections, the efficient treatment in both dosage and the length of time the patient is kept under observation and treatment, and the proper treatment of all chronic cases in like manner.

Review medical literature for, say, the past two years, and you will find it teeming with articles dwelling on the eradication of hook-worm, the treatment of pellagra, the use of salvarsan in lues; but little will be found concerning the eradication of our old-time enemy—malaria. I would not for a moment detract from the good work done toward the treatment of the diseases mentioned, but I do earnestly plead for the medical profession to awake from this state of lethargy concerning the elimination of a disease so easily eliminated as malaria. I venture to say that, if the same attention had been given this medical problem, and it had received the publicity in the lay Press these other diseases have, that the thousands of cases that occur annually in this great southland of ours would have been materially reduced, the unenviable reputation that certain of our districts have for being hotbeds of disease would for ever be banished, and that not only our malarial morbidity, but that from all other causes would be very much less than under present conditions, and as Harris [34] stated in his address as Chairman of this Section three years ago: "Prove that yellow fever and malaria are for ever stamped from the South, and our prosperity will amaze the world."

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PERSISTENCE OF EOSINOPHILIA AND PERSISTENCE OF ABSENCE OF EMBRYOS IN PERIPHERAL BLOOD IN A CASE OF *FILARIA LOA* INFECTION.

By GEORGE C. LOW, M.A., M.D.

IN THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE for January 2, 1911, in a paper on *Filaria loa*, I described a series of cases of infection by this parasite, and pointed out the four essential points required in making a diagnosis. Since that time I have been able to follow up Case 3 of this series more fully, and have recently had the opportunity of examining the patient's blood again—that is, a little over a year after my first examinations.

The summary I gave of the case in my paper of January 2, 1911, was as follows: "Once a swelling of arm. (?) Calabar swelling. Great pain in eyeball and photophobia; never any sign of *F. loa;* no diurnal microfilaria in blood. Eosinophilia, for which no reason could be assigned, present."

The date of the occurrence of the swelling of the arm was April, 1908. His blood examination on the day I first examined him, July 14, 1910, was as follows:—

Blood Examination, July 14, 1910.

R.	4,500,000
W.	4,200
Hb.	85 per cent.

Differential.

Polymorphonuclear	55.6 per cent.	500 counted.
Large mononuclear	2 ,,	
Lymphocytes	29·2 ,,	
Eosinophile	10·4 ,,	
Transitional	2·2 ,,	
Mast cells	·6 ,,	
	100.0	

Examination for filariæ.

Night blood, 11 p.m. 3 large films 0.
Day blood, 11 a m. 3 large films 0.

After that date the peripheral blood was again examined on four different occasions—over three months—and the fæces on several occasions, no ova of any intestinal parasites or other signs of animal parasites ever being found in that medium. The records of the blood examinations are as follows:—

July 18, 1910.

Second examination for filariæ, 10 a.m. 3 large films 0.

September 3, 1910.

Third examination for filariæ, 11 a.m. 3 large films 0.

September 7, 1910.

Complete count and examination.

R.	4,500,000
W.	5,000
Hb.	90 per cent.

Differential.

Polymorphonuclear	59.2 per cent.	500 counted.
Large mononuclear	3.4 ,,	
Lymphocytes	17 ,,	
Eosinophile	18.6 ,,	
Transitional	1.4 ,,	
Mast cells	·4 ,,	
	100.0	

Fourth examination for filariæ, 12 noon. 3 large films 0.

September 20, 1910.

Complete count and examination.

R.	4,820,000
W.	6,800
Hb.	95 per cent.

Differential.

Polymorphonuclear	60 per cent.	
Large mononuclear	2 ,,	
Lymphocytes	23 ,,	500 counted.
Eosinophile	14 ,,	
Transitional	1 ,,	
Mast cells	0 ,,	
	100	

Fifth examination for filariæ 11 a.m. 3 large films negative.

After this last examination the patient returned to the West Coast of Africa, with careful instructions to note if any adult filariæ appeared, or if any peculiar swellings or trouble with his eyes returned.

On April 28, 1911, I received a letter from him recording the interesting fact—corroborating my previous filarial diagnosis—that an adult filaria had twice appeared in his eye. Both times the worm only remained a very short time, and escaped, as there was no one handy at the time to extract it. It was very active, wriggling about, and the patient's attention was drawn to it the first time by its shadow being reflected from his glasses on to the paper he was reading. It caused considerable smarting of the eye, with a fairly abundant lachrymation, but before the patient could get a looking-glass it had disappeared almost as quickly as it had come. The second time attention was directed to its presence by an itching and smarting of the lower lid of the eye, but this time it only partially came into the eye, and did not cross over the anterior part.

After these appearances nothing else happened, and the patient returned to England at the end of September, 1911. He stated to me when I saw him that since the time the filaria had appeared in his eye in Africa he had not seen or felt another, but had had a good lot of severe neuralgic pain about both eyes, having had an attack of this description five days previously. A quite definite suspicion of photophobia was usually present with these attacks.

An examination of the peripheral blood for embryos was, of course, of the greatest importance, so I took a large quantity of blood, with the following results:—

October 4, 1911.

Sixth examination for filariæ, 11 a.m. 8, 20 cmm. films, 60 cmm. of blood in all; negative, no signs of any embryos.

I again examined his blood on January 2, 1912, as follows:—

January 2, 1912.

Seventh examination for filariæ, 11 a.m. 40 cmm. of blood 0.

Differential leucocyte count.

Polymorphonuclear	57 per cent.	
Large mononuclear	2 ,,	
Lymphocytes	19 ,,	500 counted.
Eosinophile	21 ,,	
Transitional	1 ,,	
Mast cells	0 ,,	
	100	

More than a year after my first examinations, then, and 3½ years after the swelling of arm his first filarial manifestation, there are still no embryonic *F. loa* present in the peripheral blood, though the eosinophilia still keeps as high as before. (Of course, one cannot positively say that embryos have never been present in the peripheral blood during the whole of that time.) That the infection is still active is, of course, evidenced by the appearance of an adult filaria in the eye (March, 1911), but as to how long this may last (reinfection being excluded), in the light of our present knowledge, it is impossible to say.

The patient returns to Africa (this time to a non-endemic centre) in a few days, and then, on his next return to England, I shall examine him carefully again.

Many theories have been put forward to explain the absence of embryos in the peripheral blood in undoubted cases of *F. loa* infection—the adults present only males, adults of both sexes, but too young to breed, non-fertilized females only present, and so on—but I am not altogether satisfied that any of these give one the real explanation.

As I said, however, in my previous paper (January 2, 1911), only prolonged investigations over long periods of time in selected cases will clear up this obscurity, and also the many others that still exist in the life history of this very interesting parasite.

"Sleeping Sickness Bureau Bulletin," No. 32, 1911, vol. iii.

Sleeping Sickness.—The above number of the *Sleeping Sickness Bulletin* contains the following papers: (1) Sleeping Sickness Investigations in Uganda; (2) Transmission. (3) Reservoir Hosts; (4) Treatment; (5) Trypanosomes without Blepharoblasts; (6) Entomological Research—Gambia; (7) Dourine in North America; (8) Cryptic Trypanosomiasis; (9) Cultivation of Protozoa and other Papers; (10) Sleeping Sickness News—Annotations—Monthly list of References.

"Bull. Soc. Pathol. Exotique," April 12, 1911.

Dermal Leishmaniasis.—Stévenel describes a dermal Leishmaniasis occurring in the district of Zinder in the military territory of the Niger. The lesion is an ulcer which has raised edges and a varying diameter of 1½-5 cm. Leishmania are constantly present in this type of ulcer, though often obscured by an infinite variety of other organisms, which must be removed by a mild antiseptic dressing before a diagnosis can be made. The author himself suffered from this form of ulceration in May, 1908. The disease commenced in his case by the appearance of three small papules resembling flea-bites.

"The Journal of the London School of Tropical Medicine," vol. i., December, 1911.

Leucocyte variation in Trypanosomiasis.—Newham records some interesting variations in the leucocytes in cases of human trypanosomiasis, one patient giving as high a count as 10 per cent. of eosinophiles. None of the usual causes of eosinophilia were present, and in the absence of those Newham believes that one is forced to the conclusion that it was due in some way to the trypanosomiasis.

In another case studied by Kerr an eosinophilia was also present, the numbers varying from 8 to 12 per cent. As far as Newham is aware, no other cases of such an eosinophilia without apparent cause have been recorded in trypanosomiasis.

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THE JOURNAL OF

Tropical Medicine and Hygiene

FEBRUARY 1, 1912.

CLOTHING IN ITS CLIMATIC RELATIONS.

AN attempt to collate what is known concerning clothing in the Tropics as regards its quantity, quality, texture, and colour was made and published in this journal in the latter half of 1909. The information was gathered from contributors in almost every country of the Tropics, and a great deal of valuable knowledge was obtained.

The quantity of clothing naturally varies with temperature, but this again alters in direct proportion to the height above the sea-level, so that not even in one country, presenting hills and dales, are the natives clad alike. The question of whether the human race generally are clothing more heavily or lightly as centuries pass is a very difficult one to ascertain. That the nude state is, or was, the natural condition of man is open to discussion. Arguments for and against are not wanting. In the first place man is, or has become, a practically hairless being so far as protection against cold or heat is concerned. That this was always so is not known, and we have but little to guide us in coming to a conclusion whether wearing clothes has contributed to diminish the hair on the trunk and limbs. The Mongolian is the least hairy of all races; the hair on the trunk and limbs being reduced to a minimum, and even the hair of the beard and moustache is scanty and appears late.

The negro races are not as a rule a hairy race; in fact, the skin of the typical West African negro is particularly devoid of hair. Indo-Europeans have the skin of the trunk and limbs more richly endowed with hair than either the Mongols or the negroes, and the beard is more abundant and thick than in any other race.

What conclusions are to be drawn from these facts it is difficult to state; for although one could point to the negro, who being a tropical dweller does not require body covering natural or artificial, and the Indo-European, being more northern, does, yet is the Mongol, a northern race that has progressed southwards only as far as the fringe of the Tropics, the most hairless of mankind.

As against the generally accepted doctrine that the weight and quantity of clothing increases proportionately as the colder regions are reached, we have the legend of the ancient Britons merely painting their bodies, at any rate, in time of war, and being unclothed. This statement there is no means of verifying, but we have recent testimony many times over from Patagonia, where in the cold districts the natives wear practically no clothes. The well-known account of one of the earlier visits of British ships to Patagonia gives it that a native woman came on board naked to the waist, with the falling snow piled on her shoulders; she showed no signs of being cold, and only laughed when one of the visitors removed the snow from her shoulders. Such are some of the apparent contradictions as to the quantity of clothing worn as regards climate, and no satisfactory explanation of the phenomena has ever come to hand. Be the clothing, however, of these primitive peoples what it may, the broad rule obtains that the weight of clothing worn decreases as the Tropics are approached and vice-versa. In Britain the average weight of clothing worn is 1 lb. to every stone weight of the body, and any marked departure therefrom is attended by a stunted growth of the young and a pathological state of both young and old. The clothing of female children and young girls is, as a rule, quite satisfactory in Britain, with the result that the girls attain a good physique. The clothing of our women of fashion varies, and at the present day it is reduced to a minimum so extreme that few keep well for any length of time, and so-called nervous "break downs" are more and more in evidence and "rest cures" are prescribed for apparently otherwise strong women. In the case of men the clothing is, as a rule, sufficient; but the "sailor suit" garments of our young boys are wholly inadequate and fully accounts for the difficulty in rearing boys compared with girls. Our youths also affect a "hardening" process, which consists of dispensing with undergarments, either drawers or vest, or in many instances both. Every medical

man engaged in examining youths coming up for entrance to any one of the public services soon becomes impressed by the enormous number that are unfit, and also by the fact that their clothing is insufficient. That state of matters may be attributed to poverty and want of food in recruits for the men of the Army, but in the case of men coming up for examination who are proceeding to the Tropics for commercial purposes and in whom poverty is not an item, the want of clothing and the physical consequences it entails are equally in evidence. The writer has examined several hundreds of young men in this grade of life before they go abroad to warm climates, and in no instance has any young man who wears neither undervest or drawers been found physically fit to take up the appointment. The conditions an underclothed young man presents are varied, but the majority have an increased temperature varying from one to as much as four degrees above the normal even at 12 o'clock noon. Other candidates have albuminuria; others present an anæmic appearance, a muddy conjunctiva, a "puffy" aspect with a "baggy" condition below the lower eyelid, a pulse of 100 or over, a "splashy" stomach, and a temperament now defiant, now churlish, or again, resentful of advice or any suggestion that they are not well and unfit. These young men are physically unfit and mentally insufficiently equipped to be recommended for any appointment. A man who has not sense enough to wear sufficient clothing to keep himself well is not one of whom good judgment in other matters can be expected. Luckily for the medical man examining it is not necessary to draw attention to the mental incapacity attending this perversion of intellect, for there are physical defects in plenty if such are sought for. In choosing men for tropical life the temperature should always be taken, and the fact of its increase will more often be found to be accompanied by insufficient clothing than with any marked pathological condition. The reason for this increased temperature when an inadequate amount of clothing is worn is difficult to account for, but the cause and effect is not as the circumstances would seem to indicate, for it may be that the clothing is removed because of the increased temperature from whatever occult cause, rather than that the temperature rises owing to primary deficiency in amount. Whatever the cause the fact remains and has to be dealt with, and it is significant that when the young man puts on underclothing the temperature in a week or two falls to the normal and remains there.

In tropical countries the European is hampered by "conventionalities" from following the mode of dress peculiar to the people amongst whom he finds himself. He cannot revert to the primitive state, partly from use and wont, but really for the physiological reason that his skin could not stand exposure to the sun. The native is equipped by Nature by his pigmented skin, but the European skin requires protection, and it is a question what kind of clothing best affords the protection needed. The amount of clothing, its texture and colour, are all of considerable moment, for not only have the effects of the sun's light-giving rays to be taken into account, but the activity of the sweat glands of the skin owing to the heat has to be considered. In cold climates the retention of heat is the factor to be dealt with; this is brought about by layers of clothing; it is not that the actual material of the garment is of consequence, but the property it possesses of retaining air in its textures. Woollen clothing is supreme in this respect, hence its applicability in the colder countries. If, instead of wool, cotton garments are worn, more layers are necessary, from the fact that as cotton, linen, or silk materials retain but little air in their texture they must be worn in several layers, so that a layer of air is maintained between the successively superimposed garments. In cold countries, where a woollen garment is worn next the skin, an undervest, a shirt, a waistcoat and coat—four layers in all—is the usual measure of clothing; but in countries where cotton is the texture of the clothing, as in North China, the cold is defied, not by four, but by seven or eight, or as many as twelve, superimposed cotton coats.

In tropical climates the question to be dealt with is, not the retention, but the dispersion of heat from the body. The evaporation from the surface of the body of the watery elements of the perspiration helps to keep the body temperature at the normal level, and the whole question of clothing revolves itself into: (1) The protection of the body from the actinic rays of the sun, and (2) the promotion of the steady evaporation of the moisture from the surface of the body.

The appropriate colour of clothing has been arrived at by practical experience and by scientific investigation. White clothing seems to be the "colour" generally adopted in many parts of the Tropics. Black is practically excluded, but dark blue serge is much affected by natives, especially of Egypt, Arabia and Syria. The protection of the head by coloured materials, by dyed feathers and by flowers would seem to indicate that experience taught mankind that the rays of the sun were hurtful to the brain and nervous system in some way, and that naturally coloured or dyed adornments were useful protecting agents. The Mohammedan fez is red, and Drs. Duncan and Sambon have separately proved that the best sun-protecting colour is an orange red wherewith to line the helmet, hat or headgear, whatever its form. The feathers so frequent an adornment of natives, especially in time of war, when long exposure to the sun is the rule (for military expeditions were, and are, seldom undertaken in cold weather) were adopted partly as a screen to the head and partly on account of the colour of the feather, natural or dyed. The feathers in women's hats of to-day are a relic of the native custom; and even in hot weather in temperate climates these are useful, although the reason for their presence has come to be regarded as a mere matter of adornment.

The protection of the spine is, by some of the contributors to our columns, looked upon as nonsense; but although this may be the case in the dorsal and lumbar regions, it is a question whether protection to the back of the neck is not a wise step when considering headgear. It is not so long since "pig-tails" went out of fashion in Western Europe. Only a hundred years ago our soldiers and sailors wore "pig-tails" as a part of the regulation uniform. The strings at the back of the Scottish Glengarry bonnet are a relic of neck protection of more substantial form; the pig-tail of the Chinaman served the same end, and in many lands and amongst many peoples a similar protection to the neck was, and is, in vogue. The sun hat in use amongst Europeans with its 3 in. brim, and with the ends of the pugaree hanging down behind, accomplish the same end, and even the pith helmet, although narrow, has a point behind which affords a shade, at any rate, as far as the fourth or fifth cervical vertebræ. The umbrella to keep off the rain was adapted originally from the sunshade in use in tropical countries, for the rain protector, in the shape of the umbrella, is a modern invention, whereas the sunshade dates from time immemorial.

In Equatorial regions the dress is the same as regards material and amount all the year round. The typical clothing worn by a European under these circumstances, as a rule, consists of: An undervest on the cellular or aertex principle; a white duck, drill or khaki coat; a pair of short drawers of linen, cotton, silk or delaine; a pair of duck or flannel trousers; a hat with a 3 in. wide brim of pith, or a double terai hat, or Panama or Manila straw, lined inside with an orange-red lining; and socks of fine Merino.

The cellular aertex undervest fulfils all scientific requirements. The glands of the skin are allowed to act, and not clogged, as they are when a closely-woven cotton, linen or silk garment, rendered impervious when saturated by perspiration, is worn next the skin. An air space is allowed for evaporation, and the body is thereby kept cool, and yet, by the superimposed coat, or shirt if no coat is worn, is the evaporation prevented becoming too rapid so as to cause chill. Lately the Aertex Company have made these undervests of a specially-dyed red fabric, so as to comply with the scientific observations concerning the action of the actinic rays on the system.

Drawers should always be worn in the Tropics, as in temperate zones. In colder countries it is not uncommon to find men, especially young men, discarding drawers in the belief that they are thereby rendered "harder." The hardening process is a great factor amongst young men, and unfortunately also mothers adopt it for their boy children. It is needless to again discuss this matter; all healthy, sensible men in Britain wear drawers. Many young men, however, wish to improve upon their "old-fashioned" parental teaching, and go without sufficient underclothing. The result is physical ruin in the way above detailed. But there is another side to the question; the absence of underclothing, especially drawers, is a filthy custom. The lower part of the body is not the most cleanly part of the frame, and especially in hot weather it becomes still less so. If no drawers are worn, the perspiration which, from the lower part of the body is unsavoury at best, escapes into the trousers which in temperate climates are never washed. The state of a pair of trousers with perspiration escaping into them from the lower part of the trunk, and the dirt acquired from the dust, &c., from every seat they sit on, renders a man thus clad unfit for polite society. Neither in the Tropics can drawers be dispensed with, for perspiration trickles downwards towards the pelvis, and the garments there are fully saturated; if no drawers are worn the trousers become saturated. The tropical resident is, however, more cleanly than the home dweller, for the former has his duck or flannel trousers washed frequently.

The selection of a suitable coat for protection against rain in the hot, moist atmosphere of the Tropics is a difficult one to decide. The ordinary mackintosh buttoned up to the neck and extending to the feet is so hot that it is not only uncomfortable, but if worn for more than five or ten minutes it becomes, especially when exercise is being taken, impossible to endure. The body gets soaked with perspiration, and as neither the body heat nor evaporation from the surface are allowed to escape the effect upon the wearer is so pronounced that the mackintosh has to be laid aside. It is always well to note what the natives do under the circumstances, and there is no better protection from rain than the hat, "cloak," and "skirt" worn by Chinese of the labouring classes. The brim of the hat projects to as much as 8 to 10 in. from the crown, so that the water falls clear of the shoulders. The cloak and skirt are made of fine reeds, of bamboo twigs and leaves or of rice straw, held together, as in making rough mats, by twine. The coat is fastened round the neck and hangs in a circular fashion over chest, back, and shoulders. The skirt is quite separate, and is tied round the waist and hangs down to below the knees. The water from the hat drips on to the cloak and runs thence down on to the skirt and drips on the ground. This is a perfect rain protector, but too crude to be fashionable for Europeans to wear. The theory of the dress, however, is perfect; there is a free circulation of air possible for all the body; the material is light, and the water is conducted off the body as rain from a thatched roof. The principle involved in this native dress should be acted upon, and were the European to wear a mackintosh cloak with a skirt round the waist, the evil effects of an impervious material made up in the usual way would be averted. No such garment, however, has yet been produced by any European manufacturer, and it is so far removed from conventionality that it is doubtful if it will be for a generation. In many parts of the Tropics "Burberry" is in use, and as the coat is always made quite loose it is an excellent rain coat even in very hot weather.

"Solaro," brought into notice by Dr. Sambon,

is an admirable material for tropical wear; it is practically impervious, light, and most durable; and made up in colours suitable for tropical climates. Cloaks and skirts of this material place ladies in a position to face any weather, wet or dusty. The colours of the " Solaro " cloth are at once becoming and calculated to protect the wearers from the actinic rays of the sun. Especially in travelling and in camp life will " Solaro " cloth be found advantageous; but even in " busy haunts " a lady in " Solaro " garments can appear daintily dressed.

The hat available for Europeans to wear is a " sou'-wester " with a flap over the ears. A " sou'-wester " of an attractive pattern is also made for ladies' wear, whereby the hair is prevented getting wet.

No leggings with an ankle protector have yet been devised for tropical wear. The ordinary leggings are too heavy and, moreover, keep the legs and feet in a soaking perspiration, which is more trying than when the water is allowed to run off the trousers into the boots. A Burberry or " Solaro " cloth legging with a flap over the laced-up part of the boot or shoe answers the purpose; but here, again, ventilation should be, and can be, arranged by making the legging of a succession of " flounces " each overlapping its fellow from above downwards. Evaporation is thus allowed for and the legs and the feet are kept cool yet dry. Perhaps some enterprising firm will take the matter up and give us a flounced legging possible to wear in the hot, wet weather encountered during the rainy season in the Tropics.

J. C.

Parasitology.

THE " ITANIMI FLY."—A NEW SIMULIUM IN BRITISH GUIANA.

In the December number of the *Journal of the Royal Agricultural and Commercial Society of British Guiana*, called Timehri, Dr. K. S. Wise, the Government Bacteriologist, gives an interesting account of " The Simulidæ of British Guiana," which includes a new species, *Simulium guianense*. This species, according to Wise, has some resemblance to *Simulium tarsale*, found in St. Vincent, West Indies. Like it, the fly is blackish, shimmering with silver grey, and has various members of the metatarsus and tarsus swollen. The legs differ so considerably as to form a readily distinguished differential character. The male imago was not found. The systematic description given by Wise is as follows:—

Imago, female: Length of the whole fly, 2.35 mm. to 3.1 mm.; length of the antennæ, 55 mm.; length of thorax, 1.25 mm.; breadth of thorax, 1.1 mm.; length of wing, 1.35 mm.; breadth, 1.1 mm. The general colour is light grey with a silvery shimmer. No interference colours or metallic iridescence were noted, except occasionally on the wings. The antenna is composed of ten joints, all of a yellowish colour, and covered with short white hairs. The distal joints are brownish. The compound eyes are deep black and well separated, and in this fly, also, the upper facets are larger than the lower. The proboscis is of yellowish-brown colour, and is composed of the same elements as that of *Simulium amazonicum*. The labrum has at its distal extremity six well-marked hooked teeth, three on each side. The maxillary palps are yellowish brown of four joints, and covered with many hairs. The first has an oval sac like a sense organ. The second to the fourth segments have numerous pitted surface markings, giving the impression of rings. The face and cheek are silvery grey, with sparse white hairs. The frons and vertex are dark, with a silvery-grey shimmer, due to scattered short white scales. The occiput and post-vertical regions show short white hairs. A thin median indistinct black stripe traverses the frons and vertex.

The thorax is almost square and of a blackish colour, with a silvery-grey shimmer. It is decorated with sparsely scattered short white scales with a thin indistinct median dark stripe. The pleuræ are bare and brownish yellow. The scutellum has black hairs projecting from the posterior edge, and short white scales on the upper surface. The metanotum is bare, with a fringe of white scales at the posterior edge. The abdomen consists of 7-8 segments, is reddish brown, decorated on the last three segments with a few white hairs. The halteres are light yellow. The venation of the wings is identical with that of *S. amazonicum*. There are numerous short hairs and bristles on the costa.

The leg markings are very characteristic, and are as follows:—In the first pair the coxa and femur are light yellow. The tibia dark yellow, with a distal band of dark-brown colour. The metatarsus is black, much swollen, and covered with short stout hairs. The tarsus is much enlarged in the second and third segments; the fourth and fifth segments are small and delicate. The second and third segments are covered with short stout hairs, while the two distal segments carry thin and long hairs. In the second pair of legs the coxa is light yellow, the femur yellowish brown; the tibia, dark brown, has a pair of spines at the distal end, and is slender (not swollen like that of the third pair); the metatarsus is pure white, with a distal black band and a long row of short tough spines. The tarsus is dark brown, with numerous stiff hairs. In the third pair of legs the coxa is yellow, the femur brown, with a proximal yellow band. The tibia is proximally yellow, shading distally to deep brown. It is much swollen, and is almost club-shaped. The metatarsus is white, with a black distal band; the tarsus is blackish brown, with many fine and long hairs.

THE LIFE-CYCLE OF *SPIROCHÆTA GALLINARUM*.

In *Parasitology* (vol. iv, part 4) E. Hindle gives the results of a detailed investigation into the life-cycle of spirochætes as they occur in fowls. The parasite in the blood of the fowl grows until it reaches a certain dimension, when it divides transversely. This process is continued, and, in Hindle's opinion, is probably the only one which takes place in the blood in the host. Some of the spirochætes may break up into coccoid bodies when they disappear from the blood, but these do not develop again in the fowl. When ingested by *Argas persicus* some of the spirochætes reach the cœlomic fluid, penetrating the gut-wall. Thence they bore their way into the various organs and break up to form the coccoid bodies, which may increase by ordinary fission, in the malpighian tubules and the gonads. Thus from the malpighian secretion and excrement of an infected tick some coccoid bodies may regain the warm-blooded host through the bite-wound. In the blood the coccoid bodies elongate and become ordinary spirochætes. Hindle does not accept for the present the view that the spirochætes can enter the red corpuscles to form the "intracorpuscular bodies of Balfour." These he regards as products of nuclear degeneration, and their association with an attack of spirochætosis is no more significant than the occurrence of hæmolysis in piroplasmosis.

SUCCESSFUL TREATMENT OF ORIENTAL SORE WITH METHYLENE-BLUE.*

Cardamatis and Melissidis remark that although many therapeutic agents have been used, none satisfactorily arrest the normal evolution of the disease. Even a 10 per cent. solution of methylene-blue has not always given satisfactory results. The application of the methylene-blue in the form of an ointment has proved in their experience a highly effective remedy in three cases. The ointment is made up of equal parts of methylene-blue, vaseline, and lanoline, and is applied in a thick layer, morning and evening, for fifteen, twenty, or, exceptionally, thirty days. The "button" is then washed with soap and water, and should become completely healed in another fifteen days or so.

Annotations

The Transmission of Kala Azar by Blood-sucking Arthropods.—Wenyon, in the first number of the *Kala Azar Bulletin* (vol. i, No. 1, December, 1911), gives a detailed account of the experimental work conducted on the transmission of Kala Azar by blood-sucking insects. His summary, which is of value, we reproduce.

(I) Patton. (1907.)—Bed-bugs are infected by feeding on cases of Kala Azar.

(II) Donovan. (1909.)—Failure to infect bed-bugs by feeding on cases of Kala Azar.

(III) Basile. (1900.)—Uninfected dogs are infected by being made to live in Kala Azar houses. *Pulex serraticeps* from infected dogs are found to harbour Leishmania.

(IV) Basile. (1911.)—*Pulex serraticeps* from uninfected dogs, fed upon spleen juice of an infected dog, are found to become infected with cultural forms of Leishmania, which are infective when injected into dogs.

(V) Basile. (1911.)—Three dogs are infected by causing them to live with an infected dog. *Pulex serraticeps* may be captured in the beds of families in Bordonaro, an endemic centre in Sicily for human and canine Kala Azar.

(VI) Basile. (1911.)—Four dogs in Rome are infected by means of fleas imported from Bordonaro. Out of one thousand fleas from Bordonaro only four were infected with Leishmania.

(VII) Basile and Visentini. (1911.)—One dog is infected by means of fleas imported from Bordonaro. The cultural forms of the canine Leishmania are identical with the forms found in fleas.

(VIII) Basile. (1911.)—In one *Pulex irritans* caught in the bed on a case of Kala Azar there occurred flagellates identical with those found in *Pulex serraticeps*. On a dog, whose owner suffered from Kala Azar, many *Pulex irritans* were found and in one of these Leishmania were discovered. Two dogs were infected by means of fleas imported from Bordonaro. *Pulex serraticeps*, *P. irritans* and *Cimex* do not become infected with Leishmania on taking up the cultural forms, though flagellates may survive for a short time in the gut.

(IX) Sangiorgi. (1911.)—The author finds flagellates in dog-fleas in Catania and concludes that canine Leishmania must exist here, an observation confirmed later by the discovery of canine Kala Azar by Pulvirenti. A dog in Turin contracts infection from an infected dog from Tunis.

(X) Basile. (1911.)—The author doubts if Sangiorgi's parasite of *Pulex irritans* is really Leishmania. One dog living with an infected dog becomes infected.

(XI) Marzocchi. (1911.)—Flagellates occur in dog-fleas in Piedmont, where neither human nor canine Leishmaniasis is known to occur.

(XII) Scordo. (1911.)—Intestinal bacteria of fleas hinder the development of cultures of Leishmania.

(XIII) Franchini. (1911.)—Failure to infect *Cimex*, *Pulex*, or *Pediculus* from cultures of Leishmania.

(XIV) Franchini. (1911.)—Mosquitoes become infected when fed on cultures of Leishmania.

(XV) Gabbi. (1911.)—On account of the experiments of Scordo and Franchini and his own failure to infect fleas by feeding them on spleen juice of

* *Bulletin de la Société de Pathologie exotique*, vol. iv., No. 10, p. 667, December, 1911.

a case of Kala Azar and seeing that he has not found *Pulex irritans*, collected from the beds of Kala Azar cases infected with Leishmania, Gabbi does not believe that *Pulex* transmits the parasite of Kala Azar.

(XVI) Alvares and da Silva. (1911.)—Fleas from infected dogs in Lisbon are found to harbour flagellates, while those from uninfected dogs are free. The authors conclude that the flagellates are Leishmania.

(XVII) Marshall. (1911.)—A monkey contracted Kala Azar when living in the same cage as an infected monkey.

In criticizing some of these experiments Wenyon states rightly that the fact that fleas are so frequently infected with *Herpetomonas* or *Crithidia*, which are sometimes parasites peculiar to the fleas and not developmental forms of trypanosomes of some warm-blooded animal, shows that the greatest care is necessary in deciding whether any particular flagellate of the human or dog-flea is or is not a developmental stage of Leishmania. The finding of such flagellates in the dog and human flea in Italy by Basile and others is capable of two interpretations. Either these flagellates represent developmental forms of Leishmania, a view which Basile adopts, or they are flagellates peculiar to the fleas. In a country where canine Leishmaniasis is common it will require laborious experiments to decide this question. It can to a certain extent be satisfactorily answered by the study of human and dog-fleas in Kala Azar free countries. Such investigations have been commenced by Marzocchi and Porter, who have found flagellates in these fleas in districts where Kala Azar is not known to occur. If it be found that the human and dog-fleas may harbour *Herpetomonas* in countries free from Leishmaniasis, then it will follow that flagellates in fleas in countries where Kala Azar is endemic are not necessarily developmental forms of Leishmania, even if these fleas are taken from Kala Azar houses or from dogs infected with Kala Azar. It is conceivable that, as Swingle has shown, one flea may at the same time harbour more than one kind of flagellate, so the dog-flea might become infected with Leishmania though its gut was already occupied by some other flagellate. It seems to Wenyon that the conclusions formed as to the canine and human origin of the flagellates of the dog and human fleas caught at random by Basile and Sangiorgi in Bordonaro and Catania have not sufficient evidence to support them.

Typhoid Fever in the Philippine Islands.—Weston P. Chamberlain, writing in the *Philippine Journal of Science*, vol. vi., October, 1911, No. 4. on the subject of typhoid fever in the Philippine Islands, concludes that typhoid is a widely scattered and common disease in the Philippines; its incidence in Manila is above the average rate for the United States and is exceeded by only a few of the worst American cities; the average admission rate among American soldiers in the Philippines exceeds that for the troops serving in the United States; medical officers from many regions report its frequent occurrence among the Filipinos.

That the statistics from the Filipino (native) Scouts show a much lower typhoid rate than for white troops, possibly due to failure to diagnose the atypical cases.

Widal reactions performed on the blood of 591 healthy Filipinos suggest a comparatively recent attack of typhoid in about 6 per cent. of adults, but do not indicate that the disease is prevalent in childhood.

Many epidemics have occurred among soldiers in the Philippines and three outbreaks among natives have been studied. Epidemics of great severity among the Filipinos are either rare or unnoticed.

That the occurrence of the disease in the Philippine Islands is quite evenly distributed throughout the year. The incidence is least in the second quarters; while the appearance of the Widal reaction in typhoid fever in the Philippines is not as a rule delayed.

Paratyphoid organisms are occasionally isolated in the Philippines.

That the leucocyte count in typhoid remains normal for whites and is slightly increased for natives. The differential count is normal for both races.

The mortality for white troops in the Philippine Islands during the last five years has been no higher than at home. It appears somewhat higher for Filipinos, but this may be due to failure to diagnose all the mild cases.

More than a third of the cases of enteric fever, whether among Americans or Filipinos, are entirely atypical and cannot be diagnosed without laboratory methods.

Over one-half of the cases occurring in the Philippine Islands can be diagnosed clinically and differ in no essential particular from typhoid fever as seen at home. This is true for both American and Filipino cases.

Much work, Chamberlain believes, still needs to be done among the natives to estimate the actual amount of mild and atypical typhoid which is occurring and to determine why extensive and destructive epidemics are not more often seen.

Amœbiasis.—Walker, in a paper on a comparative study of amœbæ, published in the *Philippine Journal of Science*, vol. vi., October, 1911, No. 4, reaches the following interesting conclusions:—

(1) That the amœboid organisms found in the Manila water supply belong to the genus *Amœba*, Ehrenberg.

(2) That the amœboid organisms cultivable from the intestinal tract of man, both from healthy persons and from cases of amœbic dysentery, also belong to the genus *Amœba*, Ehrenberg.

(3) That the cultivable species of the genus *Amœba* are not parasitic in the intestinal tract of

man; when obtained in cultures from the intestine they probably are derived from cysts of amœbæ that have been ingested with water or food and have passed unchanged through the intestinal tract.

(4) That the amœboid organisms parasitic in the intestinal tract of man belong to a distinct genus, *Entamœba*, Casagrandi and Barbagallo.

(5) That the entamœbæ are strict or obligatory parasites and are incapable of multiplication outside of the body of their host. They can not be cultivated on Musgrave and Clegg's medium.

(6) That one non-pathogenic species of the genus *Entamœba*, *Entamœba coli*, Schaudinn, parasitic in the intestinal tract of man, which includes *Entamœba nipponica*, Koidzumi, and which develops cysts containing eight nuclei, is recognized.

(7) That one presumably pathogenic species of the genus *Entamœba*, *Entamœba histolytica*, Schaudinn, which includes *Entamœba tetragena*, Viereck, and which develops cysts containing four nuclei, is recognized.

(8) That a differential diagnosis of an infection with *Entamœba coli* from an infection with *Entamœba histolytica* can be made with the microscope.

(9) That an infection with either *Entamœba coli* or *Entamœba histolytica* must always come directly or indirectly from another infected person.

(10) That water or uncooked food can transmit amœbic dysentery only when contaminated with fæcal matter from a case of amœbic dysentery.

(11) That the infection with *Entamœba histolytica* may persist for an indefinite period after the symptoms of amœbic dysentery have disappeared, during which time the resistant, encysted entamœbæ may be passed in large numbers in the stools and constitute an important source of infection to others. Such persons are " carriers ' of amœbic dysentery, comparable to the " carriers " of typhoid fever or cholera.

(12) That the prophylactic measures for the prevention of amœbic dysentery are sufficiently indicated by the preceding conclusions; they are identical with those required for the prevention of other specific infectious diseases of the intestinal tract, like typhoid fever and cholera.

Notes and News.

The Journal of Vaccine Therapy is one of the latest additions to the ranks of medical literature, and it will meet a distinct want. It is edited by R. W. Allen, and contributions to its pages will be welcomed. Amongst the articles that will appear in the February number are: " The Vaccine Treatment of Typhoid Fever," by Sir David Semple; " Experiences of Vaccine Treatment in General Practice," by Dr. MacWatters; and " The Bacteriology and Vaccine Therapy of Diseases of the Respiratory Tract," by Dr. Allen himself. This list gives an idea of the scope of the articles that will be found in the new journal, and as the subject of vaccine therapy has become one of such importance, it behoves all practitioners to study the contents of the different numbers that will appear monthly with the greatest care.

Review.

RECENT METHODS IN THE DIAGNOSIS AND TREATMENT OF SYPHILIS. THE WASSERMANN SERUM REACTION AND EHRLICH'S SALVARSAN. By Carl Browning, M.D., and Ivy Mackenzie, M.A., M.B., Ch.B. London: Constable and Co., Ltd., 10, Orange Street, Leicester Square, W.C.

THE authors state that the contents of their volume is essentially a record of original work, and that the results of a considerable part of the researches have appeared in different forms in various journals. While this is so, other observations are published in the book for the first time. It has been found to be impossible to give a complete review of the very extensive literature on the matters under discussion, but every effort has been made to omit no facts of theoretical or practical importance. The authors state that the references have been selected so as to enable those who are interested in any particular subject to obtain access to the original sources, and as far as possible they have been brought up to date. Professor Muir contributes an introduction, and in concluding states that the work goes forth as an attempt on the part of unprejudiced observers to test the value of the Wassermann reaction and of Ehrlich's method of treatment of syphilis. No impartial reader, he believes, will fail to appreciate the labour expended by the writers in carrying out the researches recorded, and in this we fully agree with him. The subject of the treatment and diagnosis of syphilis has advanced so enormously of late that the ordinary individual, especially in the Tropics, finds it very hard to keep up with the times, and to him a book such as this must prove a great boon. It is clearly and well written, and can be thoroughly recommended to all who wish to get up the subject, especially with a minimum of trouble.

Notice.

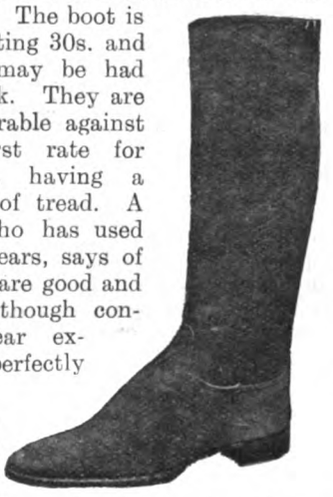
THE SOCIETY OF TROPICAL MEDICINE AND HYGIENE.

AT a meeting of the Society of Tropical Medicine and Hygiene, held at 11, Chandos Street, Cavendish Square, London, W., on Friday, January 19, 1912, the following gentlemen were elected Fellows:— Charles Joseph Fagan, M.B., British Columbia; Randolph H. Grimm, M.D., Savannah, Georgia; Lawrence C. Vigor Hardwicke, M.B., London;

Naguib S. Messiha, Paris; Hugh Clement de Souza, L.R.C.P. and S., The Gold Coast; Donald Steel, M.B., Townsville, Queensland; Rev. W. Y. Turner, M.B., Nyasaland; S. B. Wolbach, M.D., Harvard University, U.S.A.

Drugs and Appliances.

Boots for the Tropics.—The importance of good foot wear for the Tropics cannot be over-estimated. It is one of the first items in a traveller's outfit. Norris, of 55, Bishopsgate Street, E.C., produces a boot termed the "N" boot which meets most of the requirements necessary. The boot is made in two grades, costing 30s. and 21s. respectively, and may be had either in brown or black. They are well made and invulnerable against dampness, and are first rate for shooting or marching, having a very comfortable width of tread. A writer from Uganda, who has used these boots for some years, says of them: "The 'N' boots are good and keep beautifully soft, although constantly wet; they wear excellently, and I am perfectly satisfied with them." This coming from a damp, steamy climate such as Uganda speaks for itself. Intending visitors to the Tropics should try them. The firm also supplies a mosquito boot for evening wear in the Tropics as seen in the diagram. These are made of soft brown leather uppers cut high to come well up the legs, and thus protect the ankles. They are specially recommended as affording great protection from mosquitoes, thus preventing to a large extent malarial fever, bites of ticks, &c. They will be found very useful, especially in places where mosquitoes are numerous and troublesome.



Beef Extracts.—Amongst beef extracts Lemco finds a high place. This product was invented in 1865 by the eminent chemist, Justus von Liebig, who was awarded a gold medal (Paris, 1867) for creating a new industry in the world. Since that time—nearly fifty years ago—Lemco has reached to the corners of the earth, and has won the highest awards in the great exhibitions of the world. It can be used in place of beef tea, being much cheaper, and what is also of great importance, it can be made in one minute, without any of the fuss, trouble and long delay incidental to the preparation of the home-made beverage. But Lemco has other important features which make it peculiarly indispensable to invalids. Being entirely free from fat, enfeebled digestions can assimilate it with ease when nothing else can be taken; whereas the crude methods of necessity employed in the making of ordinary beef tea render freedom from fat and waste matters impracticable. That is why beef tea so often nauseates when Lemco can be retained. Lemco is a splendid digestive, as well as a sustenant; its constant use tones up the digestive system to a condition of healthy activity, prevents waste of valuable proteid by incomplete assimilation, and so enables even the most delicate to get the maximum nourishment from other foods.

Personal Notes.

India Office.

From December 9 to January 13.

Arrivals Reported in London.—Major W. H. Kerrick, I.M.S., B.; Captain W. C. Long, I.M.S., M.; Captain C. E. Bulteel, I.M.S.; Captain W. Gillitt, I.M.S., B.; Captain E. H. B. Stanley, I.M.S.; Captain R. E. Lloyd, I.M.S., B.; Lieutenant-Colonel T. E. Dyson, I.M.S., Bo.; Major W. E. Scott-Moncrieff, I.M.S., B.; Major C. B. Prall, I.M.S., B.; Lieutenant-Colonel J. B. Smith, I.M.S., Bo.; Captain T. T. Thompson, I.M.S.; Major R. H. Price, I.M.S.

Extensions of Leave.—Captain H. P. Cook, I.M.S., 2 d.; Lieutenant-Colonel J. Penny, I.M.S., B., 7 d. on M.C.; Captain R. D. MacGregor, I.M.S., B., 6 m. M.C.; Captain A. G. Tresidder, I.M.S., 1 m. M.C.; Captain J. M. Holmes, I.M.S., 1 m. M.C.; Captain A. J. H. Russell, I.M.S., 5 m. M.C.; Lieutenant-Colonel J. Chaytor-White, I.M S., B., 3 m. M.C.; Lieutenant R. B. Lloyd, I.M.S., 3 m. M.C.

Permitted to Return.—Major D. R. Green, I.M.S., B.; Captain J. W. McCoy, I.M.S., B.; Captain A. G. Tresidder, I.M.S.

List of Indian Civil Officers on Leave (including Military Officers under Civil Rules).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Bedford, Lieutenant-Colonel C. H., I.M.S., 8 m., April 18, 1911.

Brierley, Captain C. J., I.M.S., N.-W.F. Prov., 12 m., March 19, 1911.

Chaytor-White, Lieutenant-Colonel J., I.M.S., U.P., 24 m., March 26, 1910.

Fisher, Major J., I.M.S., D.S.O., Rajpootana, 18 m., May 26, 1909.

Green, Major D. R., I.M.S., E. B. and A., 26 m., Feb. 8, 1910.

Kenrick, Major W. H., I.M.S., C.P.

Kilkelly, Major P. P., I.M.S., Bo., 24 m. March 13, 1911.

Lane, Lieutenant-Colonel W. B., I.M.S., C. P. Prisons, 18 m., June 7, 1911.

Lapsley, Captain W., I.M.S., U.P., 16 m. 25 d., May 18, 1911.

Long, Captain W. C., I.M.S., M.

MacGregor, Capt. R. D., I.M.S., Burma, 12 m., April 28, 1911.

Melville, Major H. G., I.M.S., Lahore, 12 m., October 3, 1911.

Penny, Lieutenant-Colonel J., I.M.S., Burma, 23 m. 7 d., February 21, 1910.

Pratt, Lieutenant-Colonel J. J., I.M.S., U.P., 18 m., November 16, 1910.

Rait, Major J. W. F., I.M.S.B., 18 m., September 20, 1910.

Scott-Moncrieff, Major W. E., I.M.S., N.W.F. Prov.

Smith, Lieutenant-Colonel J. B., I.M.S., Bo., 12 m., November 17, 1911.

List of Indian Military Officers on Leave.

Showing the Name, Regiment, or Department, and the Period for which the Leave was granted.

Bulteel, Captain C. E., I.M.S.

Lloyd, Captain R. R., I.M.S., 11 m., from July 29, 1911.

Lyons, Colonel R. W. S., I.M.S.

Norman, Lieutenant V. P., I.M.S.
Price, Major R. H., I.M.S.
Reeves, Colonel F. C., I.M.S.
Russell, Captain A. J. H., I.M.S.
Stanley, Capt. E. H. B., I.M.S.
Tresidder, Lieutenant A. G., I.M.S., 8 m., from June 24, 1911.
White, Lieutenant-Colonel W. W., I.M.S., 1 y. 10 d., February 26, 1911.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"Indian Medical Gazette," December, 1911, vol. xlvi, No. 12.

The Treatment of Oriental Sore.—Jolly considers the treatment of oriental sore. Local treatment he believes is the only satisfactory line to adopt. Excision is only applicable to early cases when the sores are few in number, and not situated on the face. In two or three cases in which Jolly has excised such sores and sutured the skin, primary union has occurred. Scraping, taken all round, is the method of most general application. It is indicated when the sores are not situated on the face, and when ulceration is not very extensive. The scraping should be done thoroughly, special attention be paid to the edges, which should be rendered flush with the surrounding skin. The sores may then be swabbed with pure carbolic acid, and dressed with any moist antiseptic dressing. In the after-treatment, mercury ointments, especially unguentum hydrargyri ammoniati, appear to hasten healing and prevent relapse. Many local applications in the nature of caustics have also been tried, likewise X-rays and more recently carbon dioxide, but none of these seem to be superior to scraping.

"Indian Medical Gazette," December, 1911.

Helminthiasis Simulating Appendicitis.—Pickle describes an unusual case of worms in the peritoneal cavity simulating appendicitis. Diagnosed as the latter disease the patient was operated on, when on opening the peritoneal cavity nothing abnormal could at first be seen except thickened peritoneum. On prolonged exploration with the fingers, however, a small abscess cavity was detected in the neighbourhood of the cæcum which contained two round worms and about ½ oz. of thick white pus. These parasites were alive when taken out and must have been obviously the cause of the whole mischief. It need hardly be mentioned that all the symptoms gradually cleared up after the operation, the wound healed by first intention and the patient made good recovery.

"The Journal of the London School of Tropical Medicine," vol. i., December, 1911.

A New Parasite of Man.—Dr. Leiper describes a new Echinostome parasite of man. The parasites were found in the intestines of Tamils from the Malay States, and resembled immature forms of *Fasciolopsis buski*, the colour, general shape, and wide ventral sucker corresponding quite closely.

Further examination, however, showed that the skin was thickly beset with stout acicular spines quite characteristic of the family *Echinostomidæ*. The only member of this family hitherto found in man is Garrison's *Fascioletta ilocana*, which Odhner has recently demonstrated is a member not of the family *Fasciolidæ*, as Garrison supposed, but of the *Echinostomidæ*. Leiper believes that his new parasite is probably not a normal parasite of man, but may ultimately be found in cats and dogs.

"The Journal of the American Medical Association," December 23, 1911.

Verruca Peruana.—Giltner writes on this interesting disease. He states that the diagnosis is not always easy, but in a person who gives a history of having been in the infected districts, showing the symptoms of fever, anæmia, vertigo, rheumatoid pains and enlargement of the lymphatic glands, verruca should be strongly suspected. When the eruption appears it is easily recognized.

The enlarged liver and spleen are not so constant as in malaria; in the latter the anæmia comes on more slowly, prostration is not so severe, lymphatic enlargement is absent, the action of quinine is positive, and the plasmodium is found in the blood.

Yaws, apparently a very similar disease, appear on the body as well as on the extremities, the general health is little affected, there are no visceral changes, the mortality is low, and the *Treponema pertenue* is found in the eruptive lesions.

The prognosis of verruca is grave, the mortality, according to some authorities, being as high as 90 per cent. Most of the deaths occur prior to the appearance of the eruption, and when it appears the outlook is more favourable, especially if it comes out rapidly and becomes general, but when it is partial or pale and atrophies without the general condition improving, it is not so good.

"British Medical Journal," January 6, 1912.

The Treatment of Yaws.—Alston, of Trinidad, reports further on his treatment of yaws by salvarsan. He now gives the results of the treatment of 500 cases from January to October, 1911, writing six weeks and four months after the 500th case was injected. His results were as follows:—

498 cases were cured (99.6 per cent.).
409 cases were cured with one injection (82.0 per cent.).
75 cases were cured after a second injection.
14 cases were cured after a third injection.
The total number of injections was 603.

As regards relapses only five cases discharged cured came back, and they were cured by a reinjection. Before salvarsan was used relapses were from 12 to 14 per cent.

When Dr. Cleaver was acting for Dr. Alston, in the latter's absence, four deaths occurred among cases that had been injected. Dr. Cleaver was of the opinion, however, that none of these deaths were the result of the injections with salvarsan, there being no local gangrene, no nerve or ear complications, and no dimness of sight. The only complication was the formation of an abscess at the seat of injection in two cases. In conclusion, Dr. Alston believes that salvarsan is a specific for yaws and that there is no danger attending its use in this disease.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

SOME EFFECTS OF THE CLIMATE ON THE HEALTH OF IMPORTED TEA-GARDEN LABOUR IN ASSAM.*

By CHARLES ROPER, M.D.Camb., D.P.H.

INTERESTING points arise from a consideration of the effect of climate and mode of life on imported tea-garden labour in Assam. I venture to publish some of my conclusions with a view to learning whether other workers in the same field can endorse them. The figures quoted in this article, and on which the conclusions are based, are taken entirely from tea-garden work, and, with a view to making them as comparable as small masses of figures may be, I have strictly confined myself to two periods, of twenty-four consecutive months' work each, in the two districts considered, thus avoiding errors that might be introduced by the monthly variation in the proportion of cases, and of deaths, due to various causes. The figures are published rather as rough indications based on practical work, than as refined and scientific statistics, bearing on the problems and possibilities concerned in the questions of the health of imported labour in Assam.

A consideration of this subject would naturally appear to call for some differentiation between the races and tribes from which this labour is drawn, and for further differentiation on account of castes and jâts, and on account of the local conditions, climatic and other, obtaining in the districts from which individual coolies of the same or of different tribes may have been recruited. A very brief survey of the mass of details concerned convinced me that such an analysis of my figures was impracticable, and that with the material at my disposal it was only possible to mass the heterogeneous items composing "imported labour," in much the same way as it is necessary to mass the very varied classes and conditions of work performed by that labour on the different gardens to which it is distributed. That is to say, to look at the figures as though they were those of the effect of similar work under similar climatic and social conditions acting on similar individuals imported from a different climatic and social environment. As I do not intend to again refer to this point, I may mention that I have instances of gardens close together where the class and amount of labour on each differs very much, and the work varies very considerably; while even more the manager's administration of his labour has to be borne in mind when considering the health problems of each individual garden. As may be readily recognized from these remarks, while the interest and variety of my work gained, the intrinsic value of my meagre statistics diminished; on the other hand, my small mass of figures would possibly conform more to those taken over the whole of Assam, than if the gardens had all belonged to one large company where recruiting, working, and administration were done on one system.

The items making up the totals are those of hospital admissions only, and the periods over which they are taken are January 1, 1906—December 31, 1907, in Lakhimpur; January 1, 1909—December 31, 1910, in Darrang. The chief climatic differences between the two districts are:—

(1) Darrang is further south, consequently it is appreciably warmer.

(2) The hot weather lasts longer in Darrang also, and consequently the plucking season, the onus of which falls on the whole labour force, but distinctly more on the women, lasts appreciably longer.

There are numerous other factors which individually might tend to produce variations in the two districts, but on the whole the resultants are approximately equal. Mention should be made, however, of the facts that in Lakhimpur my hospitals had been under regular and systematic European medical supervision, which was not the case in Darrang, and that, while in Lakhimpur none of the tea was of twenty years' standing, in Darrang several of the gardens were largely old tea, though the district is now extending rapidly.

The populations under consideration in Lakhimpur and Darrang were, roughly, in the proportion of 1 to 3. In Darrang 1910 showed a 6 to 7 per cent. increase in population over 1909. During the four years under consideration the total births were 1,225, while the deaths were 1,094, indicating that at present the increase of garden populations is almost entirely the result of importation of new coolies.

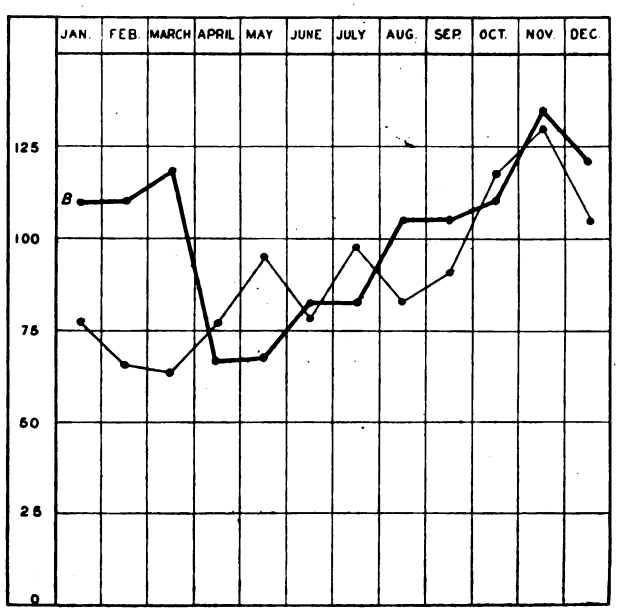


CHART L.—BIRTHS AND DEATHS.
Total Births, 1,225; Deaths, 1,094.

* These notes formed part of the writer's Thesis for the M.D. Degree, Cambridge.

TABLE I.—CASES, DEATHS AND PERCENTAGE MORTALITY.

LAKHIMPUR	TOTAL		ANÆMIA		TOTAL, EXCLUDING ANÆMIA		FEVER		DIARRHŒA		DYSENTERY		PNEUMONIA	
	Admissions to Hospital	Deaths in Hospital	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
1906	1,805	162	515	44	1,290	118	334	17	166	31	89	19	123	20
Percentage case mortality	8.97		8.54		9.15		5.09		18.67		21.35		16.26	
1907	2,086	97	736	15	1,350	82	431	16	96	11	54	6	80	10
Percentage case mortality	4.65		2.04		6.07		3.71		11.46		11.11		12 5	
DARRANG, 1909	6,215	350	2,728	63	3,517	287	492	28	553	49	651	128	172	38
Percentage case mortality	5.60		2.31		8.16		5.70		8.86		19.66		22.09	
1910	4,551	281	1,970	58	2,581	223	453	23	266	34	321	78	216	43
Percentage case mortality	6.17		2.94		8.64		5.08		12.78		24.3		19.91	

The preceding table shows for comparison some of my separate totals for the different years, cases, deaths, and percentage-case mortality.

The effect on garden health of systematic medical supervision appears considerable, but also immediately a striking difference in the two districts is noticeable—in Lakhimpur, a diminution in cases, except as regards anæmia and fever, and a striking diminution of case mortality; in Darrang, a very marked drop all along the line in cases, with a marked rise in case mortality, except as regards pneumonia, which is exactly the reverse—increased number of cases, with decreased case mortality.

It is to be noticed that a column is given for "Total admissions, excluding anæmia." The reason is as follows: A very high majority, possibly all, of the coolies are subjects of anchylostomiasis to a greater or lesser extent. Many coolies, with a considerable degree of this condition, apparently show little or no sign of its presence; others, on the contrary, show marked anæmia, though comparatively few anchylostomata are expelled in the stools after treatment. The effect of anthelmintic treatment on their anæmia is, however, immediate and marked. Throughout the whole period of my work in Assam I medically inspected the whole population of each of my gardens at regular intervals of from one to two months. At these musters I picked out coolies showing signs of anæmia (from 2 to 8 or 9 per cent.) for anthelmintic treatment. The great majority of these coolies were feeling well, and able to go about their work with little or no ill-effect, but the results on the total labour force, after a short period of this system, not only as regarded the diminution of the number of out-patients and cases of minor ailments, but also as regarded the work value of the apparently healthy individual, were very marked. It will thus be seen that it is hardly consistent to put the bulk of the cases of anæmia in line with admissions to hospital from other causes.

With regard to the treatment of this anæmia, one point in particular struck me immediately I went to Darrang, namely, the marked difference in the results of similar anthelmintic doses between the two districts. I never used thymol for this purpose, as its exhibition is so frequently followed by a severe intestinal catarrh in coolies with a considerable degree of anæmia, or in those whose intestinal mucosa is already much irritated by the presence of parasites. Eucalyptus oil and chloroform were used in a few specially selected cases. My routine course was santonin gr. v, with a purge, generally castor oil, overnight, and three doses of betanaphthol, each gr. x, at two-hour intervals in the morning, followed in two hours by a dose of castor oil; stools were collected for twenty-four hours and then washed. The great bulk of the cases in Lakhimpur showed anchylostomata over 20, and in about 50 per cent. of the cases *Ascaris lumbricoides*, 1 to 3. In Darrang a fairly average result was anchylostomata, 5 to 15; *Ascaris lumbricoides* in about 80 per cent., 3 to 6. Seeing that, in the main, the recruits were comparable in the two districts, and that prophylactic cleansing of feet and ankles in phenyl had been more thoroughly carried out in Lakhimpur than in Darrang, this feature is certainly one to be borne in mind.

Amongst such cases practically no deaths occurred. The deaths given in this group were almost entirely cases of chronic debility, dropsy, and old age, where such debility was not obviously associated with fever, diarrhœa, or dysentery. Looking at the totals for 1906 and 1907, I am convinced that the very marked increase of cases in 1907 was mainly due to my inexperience and consequent diffidence in 1906, rather than to a

large increase in the amount of anæmia in 1907; for there was no doubt as to the improvement in the general well-being of the labour in 1907, while by picking out fairly early cases one naturally considerably reduces the inevitable "tail-end" to a labour force at a somewhat subsequent period. These two factors, acting together, bring down the case mortality of anæmia in Lakhimpur in 1907 to somewhere about the right figure, that for 1906 being undoubtedly quite misleading. I consider, therefore, that but little weight should be attached to the comparison of total admissions and case mortality under the heading anæmia for 1906 and 1907, and that 1909 and 1910 give a more fair indication of what should be expected.

It is interesting here to notice, for what it may be worth, a fuller, but still rough and inadequate, analysis of figures relating to anæmia, debility, and dropsy for rather more than half the population in Lakhimpur. I find entries as follows:—

1906	Cases	Deaths M.	Deaths F.
Anæmia and anchylostomiasis ...	211	3	4
Dropsy	29	8	6
Debility	97	4	4
1907			
Anchylostomiasis	474	1	1
Dropsy and debility	?	17*	0

* Dropsy, 4; ovarian dropsy, 1; renal dropsy, 3; debility, 3; old age and debility, 5; old age and dropsy, 1.

The total 474 for anchylostomiasis in 1907 is made up entirely of cases selected by myself at muster for the betanaphthol treatment. Unfortunately, I have no record of the total cases admitted under dropsy and debility. Of the seventeen deaths under this head, thirteen have been classed with the deaths from anæmia, debility, and dropsy, and the ovarian and renal dropsy cases with "Deaths from other causes."

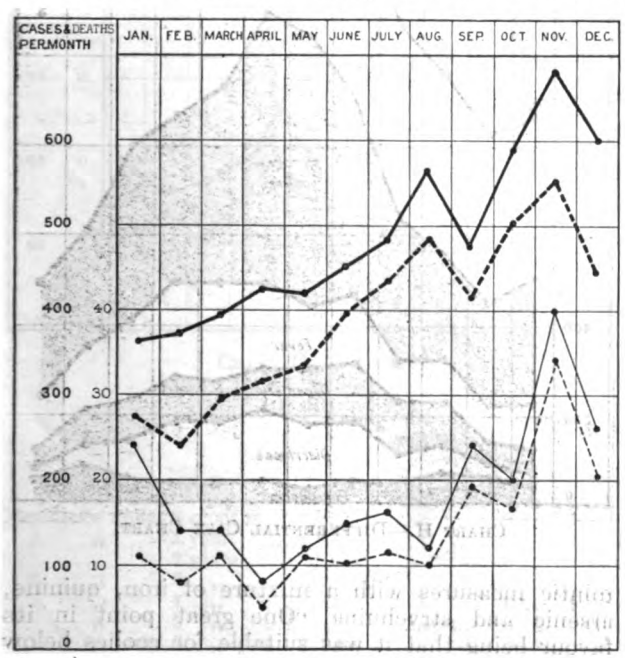


CHART A.—ANÆMIA, DEBILITY, AND DROPSY.

The dotted lines on Charts A, D, E, F and G signify totals for Darrang, the difference between these and the continuous lines being the cases arising in Lakhimpur.

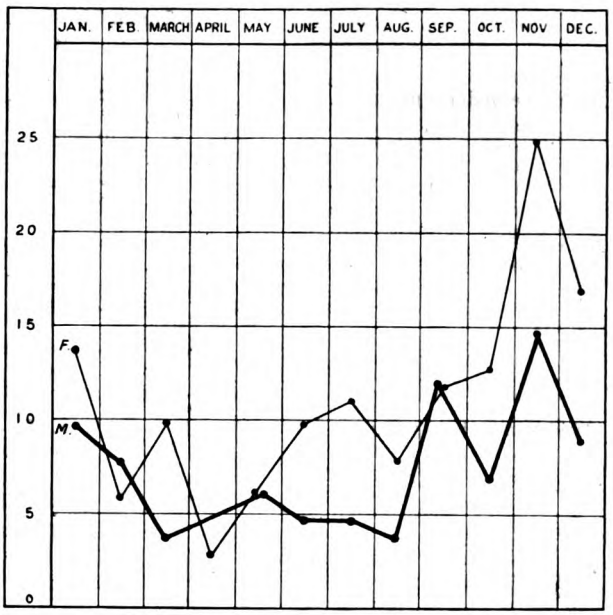


CHART B.—DIFFERENTIAL SEX DEATH CHART. ANÆMIA AND DEBILITY.

Male deaths, 90; Female deaths, 135.

For the most part the results of any one muster showed a fairly level sex distribution for the first six months of the year, but towards the end of the plucking season there come a very appreciable increase of the proportion women : men, and with this sex disproportion, the very marked total rise of cases, shown in Chart A, in the latter months of the year.

Differential sex death-charts of "Anæmia" and "All Causes" (Charts B and C respectively) show how female deaths from anæmia occur in disproportion to male deaths during the latter part of the year, as compared from deaths from all causes. Again, looking at Table III, the excess of female over male deaths is more than accounted for in the

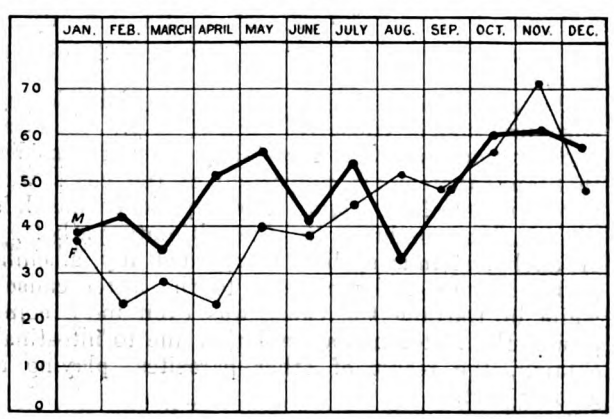


CHART C.—DIFFERENTIAL SEX DEATH CHART. ALL CAUSES.

Male deaths during year, 572; Female deaths during year, 518.

TABLE II.—DEATHS FROM ALL CAUSES.

Age	Males. Under 1	1-5	15-16	16-45	45-60	Over 60	Total	Females. Under 1	1-5	5-16	16-45	45-60	Over 60	Total
Residence under 3 months	1	4	2	13	1	0	21	1	3	2	6	3	0	15
,, 1 year	1	14	3	36	11	7	72	0	11	3	35	5	2	56
,, 2 years	0	14	10	57	9	3	87	0	12	8	61	7	1	89
,, 3 ,,	0	2	5	39	5	3	54	0	1	4	45	2	0	52
,, 4 ,,	0	7	3	29	0	2	41	0	2	1	27	2	0	32
,, 5 ,,	0	0	3	11	1	0	15	0	0	1	14	0	0	15
,, over 5 ,,	0	0	5	85	19	9	118	0	0	7	121	7	3	138
No record	2	10	8	37	12	1	70	3	6	11	18	3	0	41
Assam born	22	33	6	0	0	0	61	16	25	14	2	0	0	57
Total	26	84	45	301	58	25	539	20	60	51	329	29	6	495

TABLE III.—ANÆMIA, DEBILITY, AND DROPSY.

Age	Males. Under 1	1-5	5-16	16-45	Over 45	Total	Females. Under 1	1-5	5-16	16-45	Over 45	Totals
Residence under 3 months	0	0	0	0	1	1	0	0	0	2	1	3
,, 1 year	0	3	0	4	6	13	0	2	0	12	4	18
,, 2 years	0	2	1	9	2	14	0	3	3	16	0	22
,, 3 ,,	0	0	1	7	1	9	0	1	0	17	0	18
,, 4 ,,	0	0	2	3	2	7	0	0	1	4	1	6
,, 5 ,,	0	0	0	2	1	3	0	0	0	5	0	5
,, over 5 ,,	0	0	1	11	6	18	0	0	3	39	1	43
No record	0	1	2	8	3	14	0	2	3	5	1	11
Assam born	2	8	1	0	0	11	3	2	3	1	0	9
Total	2	14	8	44	22	90	3	10	13	101	8	135

age period 16—45, and a comparison of periods of residence shows that this disproportion lies in the total "over five years' residence." Compare this table with Table II, where the corresponding age periods only show a disparity of about 10 per cent., and of residence 18 per cent. between the two sexes, and bearing in mind that the best pluckers on a garden are to be found amongst adult women of senior residence, I think the just conclusion is that it is the hard work towards the end of a season which particularly affects the women. Again, we see from Table III that the first two years of residence markedly try the coolies, both male and female. Table II shows a similar period of stress, but whereas male deaths from all causes under two years' residence : ditto over five years : : 180 : : 118, and similar female figures show the proportion 160 : 138; when considering anæmia cases only males show 28 : 18, and females 43 : 43. That is to say, that lengthened residence increases the proportion of women dying from anæmia, but this is not so as regards the men.

It was an impossibility for me to subdivide my anæmias under causative heads, *e.g.*, malaria, anchylostomiasis, &c. I certainly did not consider that any appreciable proportion of the cases was purely malarial in origin. My experience has left me in some doubt as to the ultimate pathology of anchylostomiasis, but I regarded my anæmia in Lakhimpur as largely due to the latter cause; while in Darrang the cause was even more composite, the factor mal-assimilation due to intestinal catarrh, the result of other parasites, playing a greater part.

I understand that on some gardens courses of quinine (in 5 gr. doses) were alone given to anæmics. I preferred to follow up my anthelmintic measures with a mixture of iron, quinine, arsenic and strychnine. One great point in its favour being that it was suitable for coolies below par from a variety of causes, and thus led to greater simplicity of distribution. Certainly the amount of quinine was modified at times from

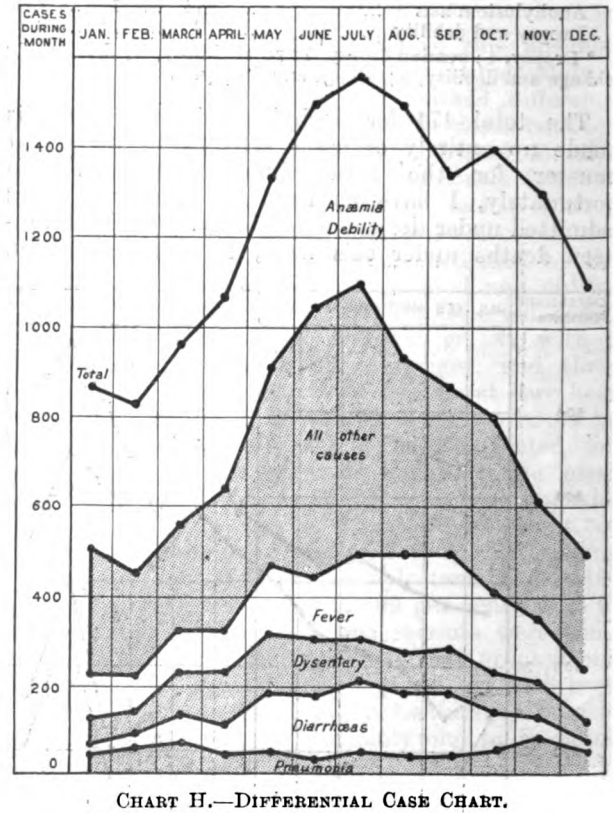


CHART H.—DIFFERENTIAL CASE CHART.

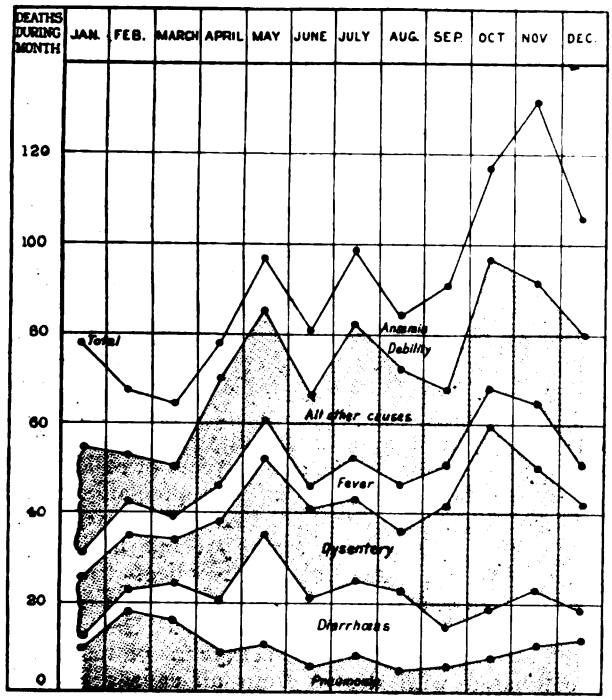


CHART K.—DIFFERENTIAL DEATH CHART.

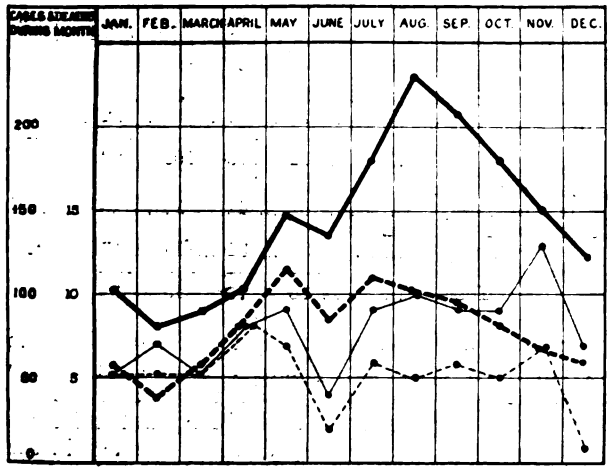


CHART D.—FEVER.

1 to 3 gr., according to the amount of fever prevalent at the time on the particular garden, but *quâ* anæmia I considered the quinine of secondary importance. Moreover, when systematically quinining the whole labour of a garden, I found that there was but little reduction of the anæmic lists.

I will say nothing more here regarding anæmia, but as may be seen from comparing Charts A and H, the anæmic admission and total admission curves do not correspond closely; on the other hand, their respective death charts are markedly similar (Charts A and K).

We come now to a consideration of fever as met with on my gardens.

The seasonal chart shows the usual rise from July to October, but the rise is very much less than might have been expected. It must be remembered, however, that the chart is of hospital admissions only. My general rule during the summer was to admit cases with a temperature of over 102° at the time of examination, or cases having a temperature of 100° on the third day of sickness. More than this was impossible at that season, as a reference to the differential case chart (H) will indicate. In the cold weather, however, it was possible to take in a larger proportion of the fever cases. Moreover, from April or May to October was the season when regular quinine prophylaxis was being carried out. It would not be fair, therefore, to regard my chart as showing the normal proportional seasonal prevalence of malaria. Although there is an entirely disproportionate number of admissions under this heading in Lakhimpur, 765 as opposed to 945, the case mortality was higher in Darrang (Table I). This was due considerably to the fact that parents brought their children to hospital far more readily in Lakhimpur than in Darrang, while it was mainly amongst children that deaths from fever occurred (half the total for both sexes were under five years of age). I certainly found considerably more fever of a mild type in Darrang than in Lakhimpur, but far more attention was given to quinine prophylaxis in the former district, and in this connection note the marked rise shown in the Lakhimpur totals from May onwards as compared with the gradual drop in Darrang.

Regarding the question of age and period of residence, some unexpected points show up

TABLE IV.—FEVERS.

	Males							Females						
Age	Under 1	1-5	5-16	16-45	45-60	Over 60	Total	Under 1	1-5	5-16	16-45	45-60	Over 60	Total
Residence under 3 months...	0	0	0	0	0	0	0	0	0	0	0	1	0	1
,, 1 year	0	3	0	1	1	0	5	0	1	0	1	0	1	3
,, 2 years	0	2	1	1	0	1	5	0	2	0	4	1	1	8
,, 3 ,,	0	1	1	2	0	0	4	0	1	0	0	1	0	2
,, 4 ,,	0	1	0	0	0	0	1	0	0	0	2	0	0	2
,, 5 ,,	0	0	0	0	0	0	0	0	0	1	2	0	0	3
,, over 5 ,,	0	0	0	4	1	0	5	0	0	1	10	0	1	12
No record	0	0	2	0	0	0	2	0	0	1	0	0	0	1
Assam born	8	15	3	0	0	0	26	4	9	2	0	0	0	15
Total	8	22	7	8	2	1	48	4	13	5	19	3	3	47

strongly, and it would be very interesting to get a large bulk of figures to see if these points are borne out in large totals. (Table IV.)

The total sex deaths being equal (48 and 47 respectively) amongst infants and children up to five years of age, we get males: females: : 30: 17 (most of these children being Assam born); amongst adults we get females: males: : 25: 11, and taking those of over four years' residence in Assam, females: males: : 15: 5; that is to say, that amongst young children malaria was nearly twice as fatal amongst boys as amongst girls; whilst amongst adults, particularly acclimatized adults, this sex susceptibility is exactly reversed.

Regarding "diarrhœas" I can say little definite. Had it been possible to closely study all one's cases, even only clinically, the results would have been interesting, if not scientifically valuable. The bulk of them being acute, however, a large proportion were either better or dead before I saw them, and the labelling of them depended a good deal on the personal equations of my doctor babus.

This heading, therefore, includes cases arising from very different causes: from cholera down to improperly cooked rice.

The seasonal curve (Chart E) is quite the usual tropical type, differing not at all between Lakhimpur and Darrang. The marked rise in May in the death line was due to a sharp and very interesting epidemic of cholera on one garden in 1910.

Regarding deaths and period of residence (Table V), little is to be noticed except that there is a tendency for males to suffer at a rather earlier period of residence than females, and that the second and third years of residence comprise a period of rapidly diminishing liability; amongst young children boys suffer disproportionately more than girls. The dysentery table (Table VI) may well be studied in comparison with Table V. Here, also, is a greater liability, more marked amongst the males, in the earlier years of residence; but in childhood the girls suffer appreciably more than the boys. It is to be noted that two deaths only from diarrhœa or dysentery occur in infants under 1 year of age, and I recollect that the dysentery case arrived in a hopeless condition on the garden. This disproportion of deaths due to bowel complaints in the earlier years of residence as compared with deaths from all causes is well shown by taking diarrhœa and dysentery together, when we get the following comparison:—

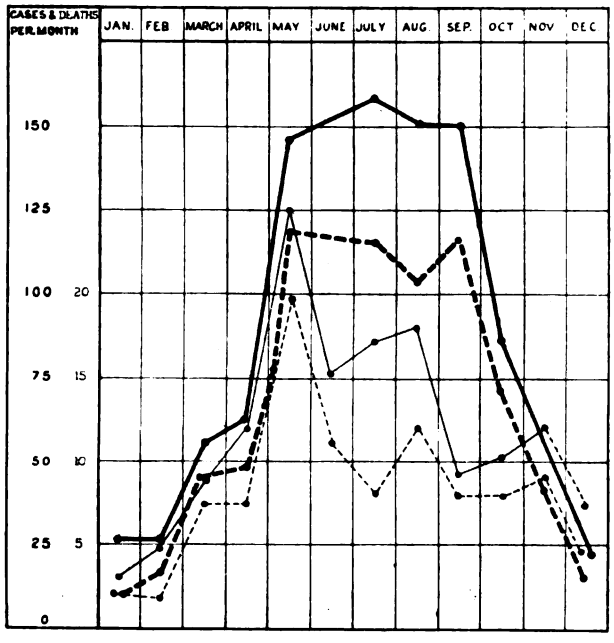


CHART E.—DIARRHŒAS.

		Under 1 year's residence	Under 2 years' residence	Under 3 years' residence	Under 4 years' residence	Over 5 years' residence
Deaths from all causes ...	M.	93	87	54	41	118
" " "	F.	71	89	52	32	138
Total ...		164	176	106	73	256
Deaths from diarrhœa and dysentery ...	M.	52	41	26	16	42
Deaths from diarrhœa and dysentery ...	F.	34	32	23	17	32
Total ...		86	73	49	33	74

Another point is that amongst coolie deaths from all causes 1 male in 6½ and 1 female in 14 are above 45 years of age, while those dying from bowel complaints show 1 male in 8, and 1 female in 12 above this age, a very distinct increase in the proportion of aged female to male deaths from these causes.

TABLE V.—DIARRHŒA.

	Males.							Females.						
Age ..	Under 1	1-5	5-16	16-45	45-60	Over 60	Total	Under 1	1-5	5-16	16-45	45-60	Over 60	Total
Residence under 3 months	0	1	0	2	0	0	3	0	0	1	0	0	0	1
" 1 year	0	1	1	5	1	1	9	0	2	0	4	0	0	6
" 2 years	0	1	1	11	1	0	14	0	0	3	4	1	0	8
" 3 "	0	0	1	5	0	0	6	0	1	1	8	0	0	10
" 4 "	0	2	0	6	0	0	8	0	0	0	3	1	0	4
" 5 "	0	0	0	2	1	0	3	0	0	0	3	0	0	3
" over 5 "	0	0	1	18	2	1	22	0	0	0	15	2	0	17
No record	0	5	0	5	1	0	11	1	0	2	4	0	0	7
Assam born	0	2	1	0	0	3	0	0	0	1	2	0	0	3
Total	0	12	5	54	6	2	79	1	3	8	43	4	0	59

In bringing the table of diarrhœa and dysentery deaths more or less into combination under the grouping of bowel complaints, I do not wish to confuse the two headings, but I would like to draw attention to Table I again, where it may be clearly seen that it is particularly in these two classes of cases that the effect of systematic treatment is seen in a gratifying reduction of cases and of deaths. Unfortunately, it is also obvious from the Darrang totals that skill in treatment did not keep pace with the success of preventive measures. Methods of treatment and prevention are without the scope of this article. I will therefore only say that measures towards prevention were of a very simple kind for the most part, and that in my opinion expulsion of intestinal parasites was mainly responsible for the drop of cases. It is a question to be considered whether the difference between the two districts in the numerical proportion of the two parasites commonly found, which has been referred to previously at some length, is responsible for the disproportionate amount of dysentery in Darrang, and for the differing tendencies of the case mortality in the two districts.

Some figures given by Bryden (quoted by Davidson in his article on Dysentery in Professor Sir Clifford Allbutt's "System of Medicine") tend to show that there is no acclimatization for dysentery amongst Europeans. My figures, so far as they go, show the reverse amongst imported coolies in Assam.

	Under 1 year's residence	Under 2 years' residence	Under 3 years' residence	Under 4 years' residence	Under 5 years' residence	Over 5 years' residence
Total deaths	164	176	106	73	30	256
Dysentery deaths	67	51	33	21	5	35

As regards the type of dysentery, the death-rate is very high for bacillary and pseudo-dysentery; on the other hand, clinically the cases were of the bacillary type, liver abscess was very rare (I do not think I diagnosed half a dozen cases altogether), and the ipecacuanha treatment of little service.

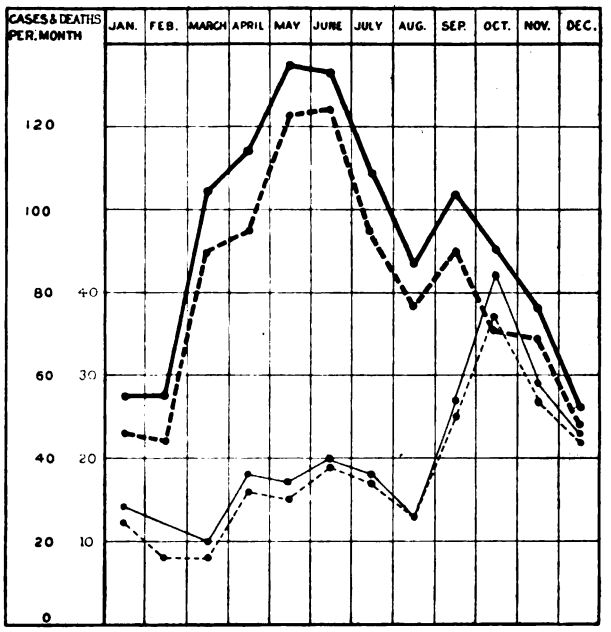


CHART F.—DYSENTERY.

It is interesting to note the very marked difference between the incidence of cases and of deaths in the seasonal chart for dysentery (Chart F), while the cases run up from February to the highest monthly total in May; that is to say, when the weather is getting warmer after the dry cold season, the advent of the rains in June at once leads to marked diminution in cases. On the other hand, the death total is at its highest in October, and higher from September to December than in any of the other eight months of the year.

Mention has already been made of a sharp epidemic of cholera on one of my gardens in May, 1910. This resulted in twenty cases and twelve deaths, and is mainly responsible for the great rise in case mortality for diarrhœas over that for 1909. In addition to this, on two gardens close to my bungalow, in 1909, twenty-one cases of cholera or choleriform diarrhœa occurred with eleven deaths, and on the same two gardens in 1910, fifteen cases with six deaths. These cases having all been under my fairly close supervision I can vouch for their nature, and taking them from the other totals we get:—

TABLE VI.—DYSENTERY.

	Males.							Females.						
Age ..	Under 1	1-5	5-10	10-45	45-60	Over 60	Total	Under 1	1-5	5-10	10-45	45-60	Over 60	Total
Residence under 3 months	0	3	1	6	0	0	10	1	2	0	4	1	0	8
,, 1 year	0	3	2	18	3	4	30	0	3	2	12	2	0	19
,, 2 years	0	1	5	19	2	0	27	0	2	3	16	3	0	24
,, 3 ,, ...	0	2	2	14	2	0	20	0	2	0	9	2	0	13
,, 4 ,, ...	0	2	0	5	0	1	8	0	0	1	11	1	0	13
,, 5 ,, ...	0	0	1	0	0	0	1	0	0	0	4	0	0	0
,, over 5 ,, ...	0	0	0	14	5	1	20	0	0	1	13	0	1	15
No record	0	0	1	5	0	0	6	0	2	0	1	0	0	3
Assam born	0	3	2	0	0	0	5	0	6	5	0	0	0	11
Total	0	14	14	81	12	6	127	1	17	12	70	9	1	110

Diarrhœa	Cases	Deaths	Case Mortality
1909 ...	532	38	7·14
1910 ...	231	17	7·36

The feature that struck me most of all in the pneumonia I met with was the extraordinary vari-

ability from year to year of the case mortality on different gardens, and this independently of whether the doctor babu was particularly competent or not, and the garden a healthy one or the reverse. In Lakhimpur my healthiest garden gave six deaths in sixteen cases in 1907 (37.5 per cent.). A very unhealthy garden in Darrang gave eighteen cases with no deaths in 1909, while early in 1910 I got on three gardens forty-six cases with twenty deaths (43.47 per cent.) in three months. One consistent feature is that in both districts the case mortality fell in the second year under consideration, though Darrang still shows a most unenviably high one. I regret I cannot subdivide the pneumonias into single, double, and broncho-pneumonia, but figures on two gardens at Lakhimpur show:—

Single	38 (1 death)	6.25 %
Double	17 (1 death)	
Broncho-pneumonia	9 (2 deaths)	

I fancy this must be above the average proportion of double pneumonia. On the other hand, I met with more cases of broncho-pneumonia in adults than I expected.

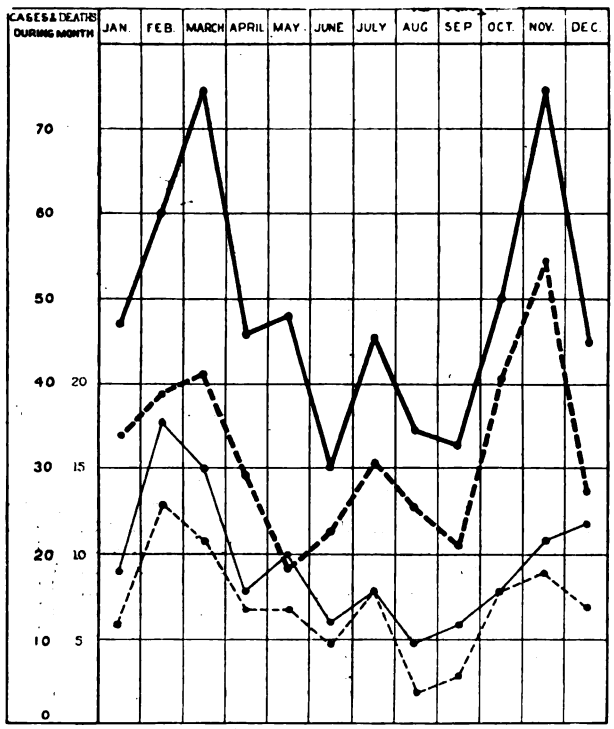


CHART G.—PNEUMONIA.

The seasonal chart (Chart G) shows a marked double rise in March and November, subscribed to by both districts, and the fact that the rainy season, when, as has been already pointed out, the women do the greater part of their hard work, does not correspond with the period of prevalence of pneumonia is largely the explanation of the great disproportion of male to female deaths (80 : 33) in a population where both sexes spend their time in outdoor work.

TABLE VII.—PNEUMONIA.

	Males				Females			
	Under		Over		Under		Over	
Residence Age	16	16-45	45	Total	16	16-45	45	Total
under 1 year	0	4	0	4	0	4	0	4
,, 2 years	1	13	1	15	1	2	0	3
,, 3 ,,	0	8	1	9	0	3	2	5
,, 4 ,,	0	8	1	9	0	1	0	1
,, 5 ,,	0	2	0	2	0	1	0	1
over 5 ,,	0	19	9	28	1	13	1	15
No record	1	4	4	9	1	2	0	3
Assam born...	4	0	0	4	3	0	0	3
Total	6	58	16	80	6	26	3	35

The effect of "Period of Residence" on the proportion of deaths from pneumonia to those from all causes is very marked.

	Under 1 year's residence	Under 2 years' residence	Under 3 years' residence	Under 4 years' residence	Under 5 years' residence	Over 5 years' residence
Deaths from all causes	164	176	106	73	30	256
,, pneumonia	8	18	14	10	3	43

and this increase is shown more amongst women than amongst men.

	Males		Females	
	Under 2 years' residence	Over 5 years' residence	Under 2 years' residence	Over 5 years' residence
Deaths from all causes	180	118	160	138
,, pneumonia	28	28	12	15

We thus see that while pneumonia becomes an increasing cause of death in both sexes as residence is more prolonged, the increased liability is far more marked amongst women.

SUMMARY OF CONCLUSIONS.

(1) The first two years of residence are the most trying for coolies, and much more so for men than for women.

(2) There is some difference between the anæmia met with in Lakhimpur and that met with in Darrang.

(3) The proportional mortality from anæmia in women increases with length of residence; in men it remains about the same.

(4) The death-rate from malaria amongst children under five years of age is about twice as heavy amongst boys as amongst girls. In adults it is two or three times as heavy amongst women as amongst men, this disproportion tending to increase with length of residence.

(5) The mortality from bowel complaints is very disproportionately high in comparison with that of all causes of death in the first two years.

(6) Amongst coolies over 45 years of age the

mortality from bowel complaints becomes greater amongst women and less amongst men.

(7) There is reason to think that acclimatization for dysentery occurs in some degree amongst imported tea-garden labour.

(8) Length of residence tends to predispose coolies to death from pneumonia.

(9) The proportion of deaths amongst acclimatized coolies from pneumonia to those from all causes, while markedly increasing in males, does so in a far greater degree in women.

THE SCIENTIFIC INVESTIGATION OF MALARIA.

By MATHEW D. O'CONNELL, M.D.

ANY investigation of malaria, such as is at present being carried on in India (see *Paludism*, Nos. 1, 2 and 3) by order of the Government, will be incomplete unless it includes detailed observations of the meteorological conditions under which the disease attains its maximum of prevalence in any locality, and, for comparison, similar observations for the same locality when the disease is at its minimum, or altogether absent. By detailed observations I do not intend yearly, or monthly, or daily means and averages, but hourly observations of the dry and wet bulb temperature, and of the rate of motion, of the atmosphere for a period of twenty-four hours.

Records of such observations would enable malariologists to ascertain definitely the meteorological conditions under which the anophelines become aggressive and bite, and also those under which they remain quiescent. Such records would also make clear the meteorological conditions under which the parasites remain latent within their human hosts for months, or indeed for years, and then suddenly resume their activity and give rise to a recurrence of the pyrexia.

For these reasons it seems indispensable that a meteorological expert should be included in the Committee for Malaria Research appointed by the Government of India. It would cost little, as expert and the necessary appliances can be supplied by the existing most efficient Meteorological Department of the Government of India.

As a slight contribution towards ascertaining the meteorological conditions under which the anophelines and parasites exhibit activity, and those under which they remain quiescent, I have prepared some tables showing the dry and wet temperature, and the rate of motion of the atmosphere throughout the night at Lahore in the month of April when malaria is least prevalent, and also for comparison similar details for the end of August when malaria begins to increase considerably. I give the details for the *night* in preference to those for the day, as it is at night that the anophelines are said to bite.

The meteorological conditions prevailing throughout the night of April 18 and 19, 1911, at Lahore, Punjab, can be seen from the following extract from the *Civil and Military Gazette*, published at that station in its issue of April 20, 1911.

Lahore	Temperature of air, F.	Relative humidity of air per cent.	Wind
April 18, 1911, 4 o'c., p.m. ...	91.9°	26	N.W.
,, 19, ,, 6 o'c., a.m. ...	67.6	62	Calm

From this it is seen that—

(1) The temperature of the air fell 24.3° F. during the night, or at the rate of 1.7° F. per hour.

(2) The relative humidity of the air rose 36 per cent. during the night, or at rate of 2.5° per hour.

(3) The motion of the air fell to "calm" at 6 a.m.

From these data, with the aid of Glaisher's tables, it is easy to construct a table giving the hourly meteorological conditions throughout the night of April 18 and 19, 1911, as under:—

LAHORE, APRIL 18-19, 1911.

Hourly Meteorological Conditions—Night.

1911		Temperature of air, F. Dry	Wet	Drying power of air per 10 c. ft.	Wind Direction	Force
April 18,	4 o'c., p.m.	91.9°	69.0°	115 grains	N.W.	+
,,	5 ,,	90.1	68.2	108.9 ,,		
,,	6 ,,	88.4	67.5	102.8 ,,		
,,	7 ,,	86.6	66.7	96.8 ,,		
,,	8 ,,	84.9	66.0	90.7 ,,		
,,	9 ,,	83.2	65.2	84.7 ,,		
,,	10 ,,	81.4	64.5	78.6 ,,		
,,	11 ,,	79.7	63.8	72.6 ,,		
Midnight,	12 ,,	78.0	63.0	66.5 ,,		
April 19	1 o'c., a.m.	76.2	62.3	60.4 ,,		
,,	2 ,,	74.5	61.5	54.4 ,,		
,,	3 ,,	72.8	60.8	48.3 ,,		
,,	4 ,,	71.0	60.0	42.3 ,,		
,,	5 ,,	69.3	59.3	36.2 ,,		
,,	6 ,,	67.6	58.6	30.2 ,,	Calm	–

There was no rain during the period of twenty-four hours ending 8 a.m. on April 19, 1911, at Lahore.

The above being the meteorological conditions during a night in the season in which malaria is least prevalent at Lahore, are presumably conditions which are unfavourable to the activity of the malaria parasite, and to the aggressiveness of anophelines.

To find the meteorological conditions under which the anophelines become aggressive, and the parasites become active and cause fever, I give below an extract from the *Civil and Military Gazette* of September 1, 1911, showing the meteorological observations for August 30 and 31, 1911.

Lahore	Temperature of air, F.	Relative humidity of air per cent.	Wind
August 30, 1911, 4 o'c., p.m. ..	87.4°	71.0	E.
,, 31, ,, 6 o'c., a.m. ...	75.8	94.0	W.

During the period of twenty-four hours ending 8 o'clock a.m. on August 31, 1911, the rainfall at Lahore was 2.25 in.

From these data we can construct a table show-

ing the hourly meteorological conditions throughout the night of August 30 and 31, 1911, as was done above for April 18 and 19, as follows:—

LAHORE, AUGUST 30-31, 1911.

Hourly Meteorological Conditions—Night.

1911	Temperature of air, F. Dry	Wet	Drying power of air per 10 c. ft.	Wind Direction	Force
August 30, 4 o'c., p.m.	87.4°	80.0°	43.0 grains	E.	+
,, 5 ,,	86.5	79.5	40.6 ,,		
,, 6 ,,	85.7	79.0	38.2 ,,		
,, 7 ,,	84.9	78.5	35.8 ,,		
,, 8 ,,	84.1	78.0	33.5 ,,		
,, 9 ,,	83.3	77.5	31.1 ,,		
,, 10 ,,	82.4	77.0	28.7 ,,		
,, 11 ,,	81.6	76.5	26.4 ,,		
Midnight 12 o'c.	80.8	76.0	24.0 ,,		
August 31, 1 o'c., a.m.	80.0	75.5	21.6 ,,		
,, 2 ,,	79.2	75.0	19.2 ,,		
,, 3 ,,	78.3	74.5	16.9 ,,		
,, 4 ,,	77.5	74.0	14.5 ,,		
,, 5 ,,	76.4	73.5	12.1 ,,		
,, 6 ,,	75.8	73.0	9.8 ,,	W.	+

The above, being the meteorological conditions throughout the night at Lahore on August 30 and 31, 1911, when malaria fever usually begins to increase rapidly, may therefore be regarded as conditions which stimulate both anophelines and malaria parasites. Still, owing to the failure of the monsoon at Lahore this year, the increase of malaria there in September is, perhaps, not very great. So I will give details of the night atmosphere at Lahore in September, 1906, when malaria was excessively prevalent, both amongst the military and civil populations. I find in the *Civil and Military Gazette* of September 7, 1906, the following details of the meteorological conditions:—

Lahore	Temperature of air, F.	Relative humidity of air per cent.	Wind
September 5, 1906, 4 o'c., p.m. ...	87.8°	71.0	Calm
,, 6, ,, 6 o'c., a.m. ...	80.0	91.0	S.E.

From the above data can be constructed a table giving the meteorological conditions hourly throughout the night of September 5 and 6, 1906, at Lahore. They are as follows:—

LAHORE, SEPTEMBER 5-6, 1906.

Hourly Meteorological Conditions—Night.

	Temperature of air, F. Wet	Dry	Drying power of air, grains per 10 c. ft.	Wind Direction	Force
September 5, 1906, 4 o'c., p.m.	87.8°	79.5°	45.5	Calm	–
,, ,, 5 ,,	87.2	79.4	43.0		
,, ,, 6 ,,	86.6	79.3	40.5		
,, ,, 7 ,,	86.1	79.2	38.0		
,, ,, 8 ,,	85.5	79.1	35.5		
,, ,, 9 ,,	85.0	79.0	33.1		
,, ,, 10 ,,	84.4	78.9	30.6		
,, ,, 11 ,,	83.9	78.8	28.1		
Midnight, 12 ,,	83.3	78.7	25.6		
September 6, 1906, 1 o'c., a.m.	82.7	78 6	23.1		
,, ,, 2 ,,	82.2	78.5	20.7		
,, ,, 3 ,,	81.6	78.4	18.2		
,, ,, 4 ,,	81.1	78.3	15.7		
,, ,, 5 ,,	80.5	78.29	13.2		
,, ,, 6 ,,	80.0	78.2	10.8	S.E.	+

The above being the meteorological environment during the night of September 5 and 6, 1906, at Lahore, a time remarkable for an exceptionally severe outbreak of malaria fever there, may be regarded as an environment under which anophelines and parasites attain their highest degree of fever-producing virulence. But whatever be the effect of such environment on anophelines and parasites, it is certain it will *of itself*, and apart from its influence on anophelines and parasites, raise the body temperature of a great number of the population exposed to it. So will the meteorological environment, previously given, of the night of August 30 and 31, 1911. But the night atmosphere of April 18 and 19, also previously given, is not such as will of itself raise the body temperature of any of those exposed to it.

From this it seems that the night atmosphere in Lahore at the end of August and in September, when malaria fever is prevalent, is such as will *of itself* raise the body temperature, but that the night atmosphere of April, when malaria is least prevalent, is not such as will raise body temperature. For proof of the accuracy of these assertions I refer to the final Report of the Departmental Committee on Humidity and Ventilation in the Humid Cotton Weaving Sheds of Lancashire (Wyman and Sons, Fetter Lane, London, E.C., price 3s. 3d.).

It will be remembered that the weavers in the cotton sheds complained that they suffered from bodily discomfort, lassitude, want of energy, and injury to health from the hot, damp atmosphere in the sheds, and which they attributed to the artificial humidification of the air that is necessary for satisfactory weaving during the hot summer months. The Home Secretary appointed a Committee to inquire into the cause of the complaints, and amongst other questions asked them to answer the following:—

"(2) At what degrees of heat and humidity combined bodily discomfort arises, and what, if any, danger to health is involved by continuous work at those degrees?"

The Departmental Committee extended its inquiry over three years, during which time many witnesses were examined, including weavers and masters, doctors and distinguished physiologists. The Committee frequently visited the cotton sheds during working hours, and finally appointed a number of medical men to make exact observations in the sheds. Those medical men recorded the dry and wet bulb temperatures of the air within the sheds, and also the body temperatures of the weavers.

Appendix II, Table I, of the final Report contains the results of these observations, 237 in all. Of these the body temperature of 61.7 per cent. was found to be increased, of 29.1 decreased and of 9.2 per cent. normal. Appendix II, Table V, contains details of the dry and wet bulb temperatures of the air within the sheds, and of the body temperature of the weavers, and the length of time they were exposed to the air within the sheds.

Of these details I give below a small number; to give all would take up too much space.

Atmospheric conditions within the cotton sheds which raised body temperature				Degree to which body temperature was raised and pulse and respiration increased by exposure to atmosphere in sheds		
Temperature F.		Drying power of air per 10 cubic feet	Length of exposure of weavers in the cotton sheds	Temperature F. in mouth	Pulse	Respiration
Dry	Wet	Grains	Minutes			
89.0°	79.0°	60.0	165	100.0°	108	24
88.0	80.0	49.0	135	100.0	108	16
87.0	79.0	48.0	135	100.4	108	24
85.5	78.0	44.5	210	100.1	82	22
85.0	77.0	45.0	170	100.4	120	24
84.5	77.5	40.5	195	100.3	130	25
84.0	77.0	39.0	195	100.3	84	25
83.5	77.5	35	225	100.1	100	20
83.0	75.0	43	210	99.3	92	16
82.0	76.0	33	135	99.2	88	14
81.0	75.0	32	15	100.0	112	31
80.0	75.0	27	at once	99.2	92	28
79.0	73.5	28	49	100.3	110	24
78.0	73.5	23	4	100.0	100	30
77.0	73.0	20	180	100.1	100	18
76.0	72.0	20	120	99.4	83	20
75.0	69.5	26	64	100.2	110	18
74.0	70.0	19	200	100.0	98	22
73.5	68.0	24.5	45	100.0	90	22
72.0	65.0	29.0	Not given	99.6	Not given*	
69.0	65.0	17	40	100.0	100	26

* Taken from Appendix III, Table II, to complete series for comparison with night meteorological conditions at Lahore.

The number of minutes exposure given in the above details is not to be regarded as the minimum time of exposure required to raise the body temperature to the degree given. It is the number of minutes after entering the shed at which the body temperature was taken. From my own observations I am certain that body temperature rises very quickly under such atmospheric conditions.

The meteorological conditions given in the table are some of those which actually raised the body temperature and increased the pulse-rate and respiration to the degrees noted in the cotton sheds. By comparing these conditions with those of the nights in September, 1906, August 30, 1911, and April, 1911, previously given, it can be seen that the night atmosphere at Lahore in the end of August and in September is such as will *of itself* raise the body temperature of a considerable number of those exposed to it, but the night atmosphere of April at Lahore is not.

	Temperature of air F.		Drying power of air per 10 cubic feet
	Dry	Wet	Gr.
Meteorological conditions at 9 o'c. p.m., at Lahore, April 18, 1911	83.2°	65.2°	84.7
Meteorological conditions in the cotton sheds which raised body temperature to 100.1° F.	83.5	77.5	35.0
Meteorological conditions at 9 o'c. p.m., at Lahore, August 30, 1911	83.3	77.5	31.1
Meteorological conditions at midnight at Lahore, September 5-6, 1906	83.3	78.7	25.6

Take, for example, the atmosphere in the cotton sheds having a dry bulb temperature of 83.5° F., which raised the body temperature to 100.1° F., and compare the details with those of the night at Lahore in April, 1911, August, 1911, and September, 1906, at the hour when the dry bulb temperature of the air was practically the same, as just given above.

Comparing these, it is seen that the dry bulb temperature, and consequently loss of heat from the body by radiation, was practically identical in all four atmospheres, but the drying power of the air and consequently loss of heat from the body by evaporation differed considerably. Whilst the drying power of the atmosphere at Lahore, at 9 o'clock p.m. on April 18 and 19, 1911, was 84.7 gr. per 10 cubic feet, the drying power of the air in the cotton sheds having the same dry bulb temperature (83.5° F.) was only 35 gr., and this impediment to loss of heat from the body by evaporation, raised the body temperature in the cotton sheds to 100.1° F. The drying power of the air at 9 o'clock p.m., on August 30, 1911, in Lahore was still less (31.1 gr.), than in the cotton sheds and would, therefore, raise body temperature still more. The drying power of the air in Lahore at midnight on September 5 and 6, 1906, was still less, 25.6 gr., and would, therefore, raise body temperature still more.

If the meteorological conditions for each hour of the nights of April 18 and 19, and August 30 and 31, 1911, and September 5 and 6, 1906, are similarly compared with those having approximately the same dry bulb temperature in the cotton sheds, it is seen that in the April night the conditions are not such as will raise body temperature *at any hour*, but in the August and September nights the condition *at each hour, throughout the whole night*, are such as will raise body temperature more than the conditions which raised body temperature in the cotton sheds. Now the weavers in the cotton sheds are never exposed to the atmosphere which raises their body temperature for more than four or five hours at a stretch, they leave it twice daily for meals, and for shorter periods for other purposes. But the inhabitants of Lahore pass the whole night, twelve hours or more during August and September immersed in an atmosphere which raises body temperature more than the atmosphere within the cotton sheds. There is no escape from it until sunrise when the air gradually becomes hotter and drier, thus again restoring free evaporation of water from skin and lungs and so reducing body temperature to normal.

Elsewhere (JOURNAL OF TROPICAL MEDICINE AND HYGIENE, March 15, 1909 and August 1, 1911), I have given reasons why the pyrexia so caused by meteorological environment must necessarily be of short duration and of intermittent type.

It seems to me, therefore, very desirable that a meteorological expert should be added to the Committee for the scientific investigation of malaria in India. This would enable malariologists to ascertain definitely the atmospheric environment under which anophelines and malaria parasites become aggressive and also that under which they remain quiescent.

Incidentally it would make clear whether the night atmosphere during the malaria season is such as will of itself, and apart from its influence on anophelines and parasites, cause an intermittent pyrexia.

ANTI-MALARIAL AND ANTI-YELLOW FEVER WORK IN CALABAR, SOUTHERN NIGERIA.

By W. Best, S.M.O..

West African Medical Staff, Southern Nigeria.

All recent District Reports in Southern Nigeria show that a most energetic and continuous campaign has been carried on against the "carrier" of malaria. The clearing of "bush" and rank vegetation, reclamation of swamps, destruction of mosquito breeding places, the use of kerosene oil for collections of water which cannot be otherwise treated, the filling in of surface depressions, the use of anti-mosquito wire-gauze for rooms and houses, and the use of quinine as a prophylactic were the chief measures undertaken.

At Abakaliki two mosquito-proof rooms have been provided. This I regard as one of the best of anti-malarial measures we possess in this country, where the enormous area of the mosquito breeding-ground precludes complete destruction of the adult mosquitoes. The comfort and protection against diseases carried by house-flies and other insects, which result from the use of this wire-gauze, are most important additional reasons for its universal employment.

The quantity and cost of the quinine issued to Natives gratuitously during the year, for prophylactic use alone, was as follows:—

275,671 gr. at a cost of £39 6s. 0½d.

In addition, 125,000 gr., at a cost of £21 5s. 9d., was issued to European officials. The following quantity was also sold to European non-officials for prophylactic use alone:—

52,090 gr. at a cost of £8 11s. 1d.

I may remark that arrangements have been made for the issue of this drug gratuitously to all children attending Government schools. This will have the effect of destroying the malarial parasites in children, 50 per cent. of whom harbour this parasite.

Kerosene oil. Fifty-five and one-eighth gallons were used for "painting" collections of water, at a cost of £4 6s. 3d.

As regards yellow fever information was received in the month of May that this disease had appeared on the Gold Coast and Sierra Leone, in an epidemic form. In order to prevent its introduction into Southern Nigeria, energetic measures were immediately adopted, especially in the chief littoral stations.

The chief features of this precautionary work were: Quarantine restrictions, the erection of a quarantine station isolation hospital, visitation of all ships, inspection of crews and passengers, &c.; popular lectures were given and leaflets distributed to the people, informing them of the serious nature of the disease, its gravity and prevention.

Destruction of mosquitoes and the abolition of their breeding-places, clearing of all bush and rank vegetation, with house-to-house visitation, were rigorously carried out, special attention being paid to receptacles capable of containing water and forming a potential breeding-ground for the Stegomyia mosquito, the carrier of this disease.

The result of the work done was most beneficial, the general sanitary condition being greatly improved. In Calabar Town two extra sanitary inspectors and a gang of 30 men were specially employed, and every house was inspected and cleaned out.

Lancet, January 6, 1912.

Lymphatic Varicocele.—Madden, of Cairo, reports that he has recently operated on three cases presenting the usual clinical signs and symptoms of variocele, but after operating has found that the swelling was due to the presence of tortuous coils of very thin-walled dilated lymphatics in the substance of the spermatic cord. The condition, as he says, adds yet another to the already lengthy list of possibilities in the scrotum, and if it is a filarial manifestation, which it almost certainly is, it is of further interest on account of its restricted distribution. Madden does not remember to have read any report of filarial lymphatic dilatation strictly limited to the lymphatics of the spermatic cord without any implication of the scrotum, either superficial or deep.

"The Philippine Journal of Science," vol. vi, October, 1911, No. 4.

Amœbiasis.—Sellards describes a series of immunity reactions with amœbæ. He states that the injection of cultures of amœbæ into rabbits resulted in the production of serum which was cytolytic for amœbæ.

This serum possessed only a low grade of activity. No inactivation resulted after exposure to a temperature of 60° C. for periods varying from thirty minutes to three hours, or 70° C. for thirty minutes. However, the antibodies of the serum were not proved to be thermo-stable, since normal serum became active when heated for one hour at 60° C.

Of the sera produced by four cultures of amœbæ obtained from parasitic and from saprophytic sources each serum was cytolytic for the corresponding culture, but not for the other three. This specificity indicates that these amœbæ are biologically distinct. Subsequent examination showed that these amœbæ were also distinguishable from each other upon a morphological basis.

Examination of the sera of amœbic dysentery patients failed to demonstrate any production of immune bodies for amœbæ during the course of the disease. However, the method which was employed was not satisfactory when applied directly to amœbæ occurring in bloody mucus stools. Consequently, the results do not represent any reaction upon amœbæ which are known to be pathogenic. Tests upon cultures of amœbæ did not give any definite evidence of the presence of either cytolisins or agglutinins in the patient's serum.

Unfortunately, as Sellards says, these results do not lead to any definite conclusion, but merely indicate that either immune bodies were not produced or that the cultures under consideration do not bear any ætiologic relationship to amœbic dysentery.

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THE JOURNAL OF

Tropical Medicine and Hygiene

FEBRUARY 15, 1912.

THE MANSION HOUSE MEETING ON BEHALF OF THE LONDON SCHOOL OF TROPICAL MEDICINE.

ON Wednesday, February 28, at 3 p.m., the Lord Mayor, Sir Thomas Crosby, M.D., will preside at a meeting on behalf of the London School of Tropical Medicine. It is gratifying to know that at last business men, more especially those who have dealings with the Tropics, are realizing the direct bearing and importance the efficiency of this School has upon their business, the size of their dividends, and the collapse or success of any and every enterprise they undertake. A few of the far-seeing and more intelligent men amongst them have realized this; but, as a rule, it requires the bitter lesson of reverses in their undertakings, owing to illness amongst their employees, to bring home the truth of their direct interest in the School.

Almost all the large business firms in this country are immediately interested in the Tropics one way or the other. Many British banks have branches, and not a few their headquarters, in the Tropics. The shipping companies of Britain are on every tropical sea, and the health of their crews and passengers is a financial question of the first importance to these companies. Mining companies in West Africa, in Borneo, in the Brazils, in Rhodesia, in Burma, or wherever metals, diamonds, or oil are sought for, depend for their development, not to mention their monetary success, upon the health of those engaged in the arduous occupations of mining, &c., in trying climates. The many railways in the Tropics worked or financed by British capital are directly concerned, and the tens of thousands of the shareholders involved in these concerns find their dividends larger or smaller, and their capital lessened in value or altogether lost, according as their native or British employees are, or are not, kept in health.

No individual in these islands is unaffected by the work this great School is attempting to do, for the price of many necessary foods is directly affected by the knowledge and training of the medical men who leave this country for the Tropics. Rice, sugar, tapioca, tea, coffee, arrowroot, not to mention so-called luxuries such as bananas, dates, raisins, nuts, and many other articles which have come to be actually necessaries of our civilization, are directly affected in price according to the number of labourers required to carry on the work of growing, carrying, packing and shipping these commodities.

Every business firm has, in making up an estimate, to allow for a large amount of surplus labour, owing to wastage due to sickness. Two, or sometimes three, men have to be engaged in place of one, so that the work may be carried on and the contract fulfilled, because of the sickness which is calculated to, and does, prevail amongst the native employees. Were the sickness reduced, the company returns would be improved by the expenses of labour being reduced, and the cost to the consumer ultimately lessened. In the great rubber industry the effects of preventable tropical diseases are more keenly brought home to us than perhaps in any other. The opening up of out-of-the-way districts for planting rubber is responsible for sickness and many deaths amongst the white and coloured *personnel* engaged; and the pitiful effects upon the young men going out from this country to engage in this work has moved several of the more humane merchants in the City of London to endeavour to assuage the sacrifice of health and life which seems to be the toll this country pays for its imperial position.

The way in which this tax of life upon our country can be best met is by educating the medical men who are sent out to take charge of the health of the employees of the companies. For this purpose the London School of Tropical Medicine has been established; for this purpose the teachers and staff of the School have given skilled teaching for several years at a reward ascribable to their philanthropic and scientific enthusiasm. For this purpose the far-seeing men constituting the Council of the Seamen's Hospital have encouraged the School, have advanced large sums of money to establish and maintain it, and are now, when the School is a pronounced success, asking those directly and financially interested in the work to come forward and help them to bear the burden they have carried so long and so successfully. That the London School of Tropical

Medicine has been a success, a magnificent success, is an undoubted fact. In the twelve years of its existence over 1,200 medical men have been trained in the School; it is by far the largest School of Tropical Medicine in the world; and though less endowed than several others, it has accomplished its mission a thousandfold.

It may be asked what can a few medical men however well trained do to stem the overwhelming tide of epidemic and endemic diseases in the vast areas of the Tropics. Can they attend to all the sick? They can do more, however, than merely administer pills and bottles of medicine; the training they receive is calculated not only to make them better practitioners, but to place them in a position to prevent disease. By educating the communities they dwell amongst they diffuse the knowledge of how disease is to be prevented, and by objective lessons show the native labourer how he may avoid illness. No man, whatever his colour, will turn a deaf ear to this teaching; life is sweet to the native as well as to the European, and the statements rife that the native is regardless of life is a slave-driver's perversion of fact to suit his purpose and contrary to the instincts implanted in all mankind.

It is satisfactory to know that we are progressing, as this meeting at the Mansion House shows, to a better state of things; and although financial benefits are put forward as the reasons for taking up this work, there is a deeper and more honourable reason present amongst the "hard-headed" business men of the City of London. Although "hard-headed" they have never been accused of being hard-hearted; they have helped the distressed in many lands when disaster overtook them; their charitable gifts have been the admiration of the world, and the money they have given has served to feed the hungry and to clothe the naked wherever calamity prevailed. By helping the London School of Tropical Medicine in its great work the business man will find that the money he advances will bring to him and to the country a better return than mere haphazard charities. These relieve only for the moment; but by encouraging the means of preventing disease and the spread of that knowledge throughout the Empire there will come a direct return for the money given, which will serve not only to benefit himself and his firm, but will help to satisfy the imperial needs of the Empire, and will dry the tears of many mothers who have allowed their sons to go abroad to deadly climates to carry on the Empire's work.

The willing sacrifice of the health or lives of these men may be a tribute to the spirit which prevails amongst us; but it is better to live and work for the imperial needs than to gain even the martyr's crown for their country's sake. The cause of their martyrdom is but a tribute to ignorance, and it would become us better to offer our libations at the altar of knowledge rather than to continue to pay toll to the powers of darkness which it is the purpose of the London School of Tropical Medicine to thwart.

Notes and News.

AN ENGLISH TRANSLATION OF QUESTIONS ASKED BY GENERAL FARIA LEAL, ADMINISTRATOR OF SAN SALVADOR DO CONGO, OF DR. GAMBLE *re* SLEEPING SICKNESS.

(1) *From which districts have come the majority of those attacked by sleeping sickness?*

The patients who have been proved by the microscope to have sleeping sickness have come from thirty-seven districts (*mvivu*), at distances varying from the neighbourhood of San Salvador to three days' journey away. These districts are: Mayanda, Ntoyo, Ntanda, Wene, Kwimba, Nkayi, Luangu, Lumbi, Mbidizi, Pelo, Nkanda, Nkaba, Lukuti, Mpangu, Esumpi, Vweba, Lungezi, Sandulula, Nsemo, Kinzau, Kioto, Ngozela, Malonga, Nkama, Mpozo, Evombo, Kimiala, Etoto, Nkoko, Nkonko, Kindwalu, Mbwela, Mbanza-Mputu, Kindinga, Luanza, Ekongo, Kialundwa. But this list does not include the cases from the districts of Zombo and Mabaya.

It is also necessary to note that the number of cases which come from any district depends rather upon the confidence of the inhabitants in us than upon the actual number of persons who may be affected by the disease.

(2) *What number of cases have been treated?*

The following statistics show the number of cases actually under treatment in the particular periods mentioned:—

December, 1908	2	November, 1910	26
April, 1909	26	February, 1911	61
July, 1909	51	May, 1911	25
Furlough from August, 1909		July, 1911	25
		November, 1911	48

From January till November, 1911, there have been 3,398 administrations of medicine.

(3) *What have been the number of deaths and* (4) *the number of verified cures?*

Recent statistics on these points, especially concerning supposed cures, are not of great value, but these are the facts:—

Period, December, 1908, *till August*, 1909.—(*a*) Of twenty-one patients who received a course of treatment of from four to six months, six have died of sleeping sickness, two have died from other causes, one still has sleeping sickness, and twelve have apparently completely recovered.

(*b*) Of twenty-three patients who received a course of treatment of from one to four months, twelve are dead and eleven have apparently completely recovered. One patient has now completed his third year under observation, and others will have completed it in January or February, 1912.

Period, October, 1910, *till November*, 1911.—The results during this period encourage us to persevere. Of nine patients who were treated from November, 1910, till February, 1911, eight are still alive. Two of the men are employed with us in

full work. But the most remarkable case is of a woman who in October, 1910, was treated for (proved) sleeping sickness, but who on September 11, 1911, gave birth to a child.

(5) *What number of those improved (the bettered ones)?*

A great number have been benefited, so much so that the natives bring their relatives. And even as to some of those who died, there is no evidence that it was from sleeping sickness; and concerning those who really did die of this disease, some were benefited during many months, to such an extent that the natives speak of the death as resulting from a return of the disease, and not as a fatal termination of the original sickness.

(6) *What is the cause of the disease—Glossina palpalis?*

Yes, *Glossina palpalis* (in Ki-Kongo "*Evekwa*") is probably the cause. I found this blood-sucker (*a*) on the road to San Salvador from the north, and at San Salvador; (*b*) on the road south-west to Mabaya, and at Mabaya; (*c*) on the east road to Kibokolo do Zombo, and at Zombo. These facts, together with information from the natives, convince me that probably all the region is infected by this pest.

(7) *Are there other transmitters?*

The following blood-suckers occur, and may be accidental transmitters of sleeping sickness: *Tabanus biguttatus* (*Evukunia*), *T. canus* (*Evukunia*), *T. congoiensis* (*Evukunia*), *T. pluto* (*Evukunia*), *T. thoracinus* (*Evukunia*), *Tabanus* (?) not identified in Kibokolo do Zombo and Mabaya, *Chrysops longicornis*, *Hæmatopota* (?) (*Evekwa-diamfwila-nitu*), *Culicoides grahamii* (*Masikasika*), *Stomoxys nigra*, *S. calcitrans*, *Larvæ of Auchmeromyia* (*Mumvidi-anzo*) in Kibokolo do Zombo and Mabaya, *Ornithodorus* (*Kinkwambanda* or *'Ata*) in Kibokolo do Zombo and Mabaya.

(8) *What treatment was employed?*

The principal treatment is by injection of atoxyl: In 1908-9, a small dose subcutaneously every day; in 1910-11, a larger dose intramuscularly twice a week.

(9) *What do you consider necessary to do in order to combat the disease?*

The whole district is too severely infected to attempt to enforce segregation, but the chiefs might be instructed to build their villages away from water.

Our Committee (of the Baptist Missionary Society, whose headquarters are Baptist Missionary Society, 19, Furnival Street, London, E.C.) have promised us funds for the erection of a very simple lazaretto outside the city, provided the Government will grant us the necessary site, for which we petitioned His Excellency the Governor-General on October 5, 1911.

The sufferers come willingly seeking treatment, but their great difficulty is to obtain food during the long period of treatment. If the Government would provide a daily ration of food, the natives would come still more willingly, and could remain all the time that might be required for proper treatment. I judge that a merely vegetable diet could be obtained for 40 reis (about 2d.) per day.

I find that the difficulty to obtain atoxyl is increasing gradually because of the increase in the number of patients. A bi-monthly grant of twenty bottles, each of 25 gm. atoxyl, would be most valuable and very welcome. Atoxyl is supplied by the Vereinigte Chemische Werke Aktiengesellschaft, Charlottenburg, in boxes of twenty bottles of 25 gm. each.

Explanatory Notes.

By Dr. M. Gamble.

The San Salvador referred to is in Portuguese Congo, and is the capital of an area bounded by the River Mposo on the west, the River Mbidizi on the south, the Fulezi on the east, and the Congo-Belge frontier on the north. To cross the district would occupy about eight days from east to west, and about seven from north to south.

The population is estimated at 25,000, of whom 1,600 live here in the capital of the ancient Kingdom of Congo.

Kibokolo do Zombo is nearly 100 miles by native path to the east of San Salvador; and Mabaya is about ninety miles to the south.

	Latitude, S.	Longitude, E.	Altitude.
San Salvador ...	6° 15′ 45″ ...	14° 47′ 18″ ...	1,840 ft.
Kibokolo ...	6° 17′ 0″ ...	15° 18′ 30″ ...	3,250 ,,
Mabaya ...	7° 3′ 45″ ...	... ...	2,044 ,,

The best map of this district is that of the Rev. Thomas Lewis, accompanying his lecture on the "Old Kingdom of Congo," see the *Geographical Journal* for June, 1908.

Leprosy.—Dr. Barbera, of Valencia, has used Antileprol, a purified form of chaulmoogra oil, in the treatment of leprosy with success. The antileprol was given in gradually increased doses until the patients took, in some cases, up to the equivalent of 300 to 350 minims daily.

Bacillus coli cystitis.—Helmitol, in 30-gr. doses, thrice daily, well diluted in barley water, answers well in cystitis due to *Bacillus coli* infection. The dose is diminished as improvement obtains.

ERRATA.

In the article on "Amœbic Dysentery," by Dr. Andrew Duncan, which appeared in our issue of January 15, p. 24, line 3 *et seq.* from foot should read "suffering for five years. During this time he had exhibited the features of the disease as described by Drs. Councilman and Lafleur."

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

Bulletin de la Société de Pathologie Exotique, Tome iv., 1911, No. 10.

Morphology of the embryos of *Filaria loa*.—Nattan-Larrier discusses the morphology and measurements of the embryos of *Filaria loa*. He gives us measurements of three living embryos taken from the uterus of an adult female 318 μ, 335 μ, and 305 μ. These measurements seem to be much too great. As the author says, they are much greater than those indicated by Penel, who gave 250 μ to 260 μ as the length, by 5 μ to 6 μ for the breadth. Penel, however, measured his embryo after being fixed in 2 per cent. formalin. In measurements of specimens stained by neutral red Nattan-Larrier got an average length of 263 μ (longest measured 289 μ, shortest 232 μ), with a breadth of 6 μ or 7 μ. These figures correspond closely with those obtained by Low (*Journal of Tropical Medicine and Hygiene*, January 2, 1911), who got an average length of 245 μ (longest measured 280 μ, shortest 220 μ), with a breadth at the broadest part of 7 μ. As Nattan-Larrier points out, however, some of these were made in dried and fixed specimens. The ones with which they were compared —the measurements of so-called *Filaria diurna* embryos— were, however, made from fresh living specimens; therefore if these are the same as the embryos expressed from the uterus of the *Filaria loa* it is difficult to see how Nattan-Larrier got such excessive measurements as the 318 μ and 335 μ given above.

"British Medical Journal," February 10, 1912.

Blackwater Fever.—James, of Ancon in the Canal zone, Panama Canal, goes to the trouble, and that somewhat elaborately, of controverting a so-called discovery, by a Dr. Anthony, published in the *British Medical Journal* of November 18, 1911. Dr. Anthony's claim was the demonstration of a specific organism in 187 cases of blackwater fever, an organism to which the extraordinary name of the *Treponema spirillum verticalis* was given by its discoverer. It is not now usually considered necessary in the tropical research world for such discoveries to be noticed at all—they are usually met with a discreet silence, a silence which ultimately kills them far more effectually than a discussion on their merits or demerits. Such discoveries are really hardy annuals or biennials. They spring up, then wither, then die and so sink back into the oblivion from which they have sprung. What will very likely happen now is that Dr. Anthony will reply to Dr. James's letter and a discussion or even a polemic will arise over this new prodigy of tropical medicine. Silence would have, as already said, given it its quietus in a much more dignified manner. All that need have been said on the matter would have been to recommend Dr. Anthony to study carefully Dr. Andrew Balfour's article on "Fallacies and Puzzles in Blood Examination" in the fourth report of the Wellcome Tropical Research Laboratories.

"Kala-azar Bulletin," No. 1, vol. i, December, 1911.

Dermal Leishmaniasis in Egypt.—Wenyon, writing on this subject in the above number of the *Kala-azar Bulletin*, states that Ferguson and Richards find in Egypt that—

(1) Certain forms of skin affection caused by *Leishmania tropica* occur not infrequently in Egypt.

(2) They may be solitary or multiple, and in the latter case are almost certainly the result of auto-inoculation.

(3) They consist essentially of a mononuclear infiltration of the subcutaneous tissues which harbour, sometimes, large numbers of the parasites.

(4) The lesions manifest themselves clinically under two forms: One, a slightly raised, smooth, flat patch; the other, a prominent warty growth. They run a chronic course, and are unaccompanied by constitutional disturbance.

(5) They are best treated by excision and immediate skin grafting.

"Public Health and Marine Hospital Service of the United States, Public Health Bulletin," No. 50, October, 1911.

Rat Leprosy.—Currie and Hollmann continue their studies on rat leprosy. After a series of exhaustive experiments they find that they cannot get the bacillus of this disease to grow. Media of various kinds were tried, and especially Clegg's method of growing in symbiosis with amœbæ and cholera germs; but all ended in failure. In one instance a streptothrix appeared, but this the authors look upon as an accidental contamination.

"Annals of Tropical Medicine and Parasitology," December 30, 1911, Series T.M., vol. v, No. 3.

Mosquito Destruction.—Wise, writing on "An Examination of the City of Georgetown, British Guiana, for the Breeding Places of Mosquitoes," states that a most serious disadvantage under which the inhabitants allow themselves to labour is an excess of vegetation and litter in their yards and lots. No less than 261 premises were kept in a condition which can only be described as disgraceful. The exclusion of the sun keeps the premises damp and dark, and provides excellent cover and breeding places for mosquitoes, rats, and other noxious insects, vermin, &c. The exclusion of fresh air and the general dampness encourage and aid the spread of tuberculosis.

"The extraordinary collection on some premises of old tins and other worthless rubbish giving rise to stagnant water has to be seen to be believed.

"The city of Georgetown," the author goes on to say, "is richly supplied, not only with mosquitoes but also with convenient and comfortable breeding places. It seems almost impossible to realize that during the wet season over 70 per cent. of all premises in this city are breeding countless myriads of these pests, and that during the dry season nearly 60 per cent. are equally incriminated."

"This state of affairs, occurring as it does in a city priding itself on being up to date, is scarcely to be credited, and reveals the urgent necessity for vigorous and prompt action by those responsible for the health of the city.

"Undoubtedly the presence of numerous unscreened barrels contributes most to this state of affairs, and the close screening of a barrel and the provision of a tap near the bottom should be a *sine qua non* for even tolerating their existence."

And this is the year 1912; *further comment is unnecessary.*

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

EXPERIMENTAL TREATMENTS FOR LEPROSY.

By T. Lindsay Sandes, M.A., M.D.,
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The following is a condensed report on some of the diets, drugs and preparations tried by me in the Robben Island Leper Asylum in the hope of evolving a curative or ameliorating treatment for leprosy.

The tabular statements show at a glance the details, and appended to each are a few concise explanatory and supplementary notes. In all cases treatment was continued until the wish for cessation was emphatically expressed by the patient and the inutility of such treatment amply demonstrated to both patient and medical attendant.

A.—Diet of Fruit and Vegetables Exclusively.

	Number of patient	Variety of leprosy	Treatment	Date of cessation of treatment	Period of treatment	Comments
				1910		
1	621	Tubercular	Fruit only	March 8	16 days	Period too short for fair comment.
2	407	Anæsthetic	,,	October 10	9 months	No improvement.
3	502	Tubercular	,,	,,	9 ,,	Worse.
4	1,113	,,	,,	August 29	6 ,,	,,
5	1,029	,,	,,	October 1	8 ,,	No improvement.
6	726	,,	,,	March 31	28 days	Period too short for comment.
7	971	,,	,,	October 31	2 years	Improvement at first. Later retrogression.
8	984	Mixed	,,	August 29	5½ months	Worse.
9	792	Anæsthetic	Vegetables and fruit	Continues	Over 5 years	Improvement.
10	1,118	Tubercular	Fruit only	October 10	6 months	Worse.

This diet of fruit in the initial stages seemed to have a beneficial effect on the patients' general condition. In consideration of the fact that the great majority of the patients do no physical labour and obtain a liberal allowance of other foods, the ration of meat (1 lb. daily) is too much. It is a source of considerable digestive trouble and of more remote ill-effects to an enforcedly lethargic people. When, therefore, a fruit or vegetarian diet is substituted it not only constitutes an agreeable change, but also leads presently to a salutary diminution in the activity of nitrogenous metabolism. Unfortunately the novelty wears off, the monotony of the diet asserts itself, the leprotic manifestations are not (so far as I could see) directly affected and the patient, observing no improvement to compensate for what he now considers a privation or hardship, lapses from the diet.

Considering all factors I do not think that a vegetable or fruit diet exclusively is of much value in the treatment of leprosy as a disease.

B.—"Jagger's Root" Cure.

Acting under instructions, this reputed cure was given a re-trial. Twelve anæsthetic cases with definite circumscribed maculæ were selected. The prescribed instructions, as follow, were accurately carried out:—

(1) The affected parts or white patches were bathed with warm water, rubbed, presumably to remove scales, and a paste of powdered bark No. I applied from twelve to twenty-four hours. The resultant blister was pricked and the elevated epidermis removed.

(2) The raw sore was then treated with a paste of powdered root No. II and continued till healed.

(3) Powdered roots Nos. III and IV were added occasionally to preparation No. II.

(4) Powdered root No. II was mixed with patients' food at one meal daily.

Of the twelve patients, nine finding the application highly uncomfortable and irritating tore off the paste and refused to reappear for further treatment, affirming that this root had been already tried without avail and that they would not be further victimized. By the exercise of much persuasive eloquence three carried out instructions to the end.

The application raised large blisters, which in the case of No. 643 became ulcers requiring attention for months afterwards. The pigmentation of the patches had not returned, nor sensation of a normal acuity, at time of computing these notes. The treatment had apparently no effect whatsoever on the disease, although hiding or covering one of its principal cutaneous manifestations for a time.

Number of patient	Variety of disease	Treatment commenced	Results
		1911	
1,180	Anæsthetic	December 2	Disease unaffected.
1,163	,,	,,	,,
643	,,	,,	,,

C.—Thyroid Gland.

Thyroid gland does no good in tubercular leprosy, as Table C clearly indicates: rather, it has a bad effect. This I ascribe to the high iodine content in thyro-albumen, the principal and most active constituent in the glandular secretion.

D.—Treatment by Vaccines.

Much attention has been recently directed to the treatment of diseases caused by the activities of micro-organisms by what is known as vaccines or the injection of the specific bacteria, dead or of modified virulence, in order to accelerate or increase the production of those substances concerned in

C.—Thyroid Gland Extract.

No. of patient	Variety of disease	Date of commencement of treatment	Period under treatment	Daily dose in grains	Total quantity consumed	Presence of bacilli at this date	Result
1,117	Tubercular	Aug. 5, 1910	14 months	5 and 10	4,085 gr.	+	No improvement. Worse.
1,277	,,	June 1, 1910	3 ,,	5	450 ,,	+	Much worse.
1,294	,,	Feb. 3, 1911	6 ,,	5	905 ,,	+	,,
1,061	,,	June 3, 1911	6 ,,	5 and more	1,355 ,,	+	,,

affording immunity. A bacillary emulsion was therefore made containing at first approximately 10,000,000 leprosy bacilli, dead, per cubic centimetre. Later the concentration of the bacilli was doubled, trebled and quadrupled.

Allowing for the vagaries of the patients and interruptions due to occasional indisposition, inoculation was performed regularly three times weekly for many months. There was apparently no local or general reaction. Estimations of the opsonic index in my hands gave no constant results nor guidance as to modification of treatment.

In consideration of these results the treatment by vaccines is distinctly a failure. This treatment, however, on a larger scale and with suitable modifications, merits a re-trial and should not be forthwith condemned.

D.—Vaccine Treatment.

No. of patient	Variety of disease	Concentration of bacillary emulsion	Frequency of injections	Amount of each injection	Total quantity injected	Period of treatment from April 6, 1910	Examination of nasal smears for bacilli at this date	Results
1,228	Mixed	First month 10,000,000 per c.c., later 20,000,000, 30,000,000, and 40,000,000 per c.c.	Three times weekly	First month 1 c.c., after 2 c.c.	92 c.c.	6 months	+	Worse.
1,198	Tubercular		Three times weekly		119 ,,	7 ,,	+	No improvement.
1,243	,,		Three times weekly		114 ,,	7 ,,	+	,,
1,277	,,		Twice weekly		48 ,,	3 ,,	+	Worse.

E.—Preparations of Arsenic.

The preparations "Soamin" and "Orsudan" are trade names, representing Burroughs Wellcome and Co.'s manufacture of two of the Arylarsonates. "Soamin" is chemically sodiumparaaminophenylarsonate, and "Orsudan" is sodium 3-methyl-4-acetylaminophenylarsonate.

Both these drugs have a rapid and beneficial effect on syphilitic lesions, but, in common with the ordinary preparations of arsenic, seem devoid of action in leprosy. The use of these drugs was in all cases gradually pushed until finally toxic symptoms appeared, when appropriate moderation was applied.

There were no serious nor permanent sequelæ such as optic neuritis or other dangerous disturbance of the nervous system. None of the cases treated showed improvement.

F.—Salts of Iodine.

The salts of iodine seem frequently to have a profound influence in causing the disappearance of pathologic products. Potassium iodide, in particular, is in constant use for this purpose. It has

E.—Preparations of Arsenic.

No. of patient	Variety of disease	Preparation of arsenic	Dose and method of administration	Total quantity of drug taken	Date of commencement of treatment	Period of treatment	Bacilli at this date	Result
			By mouth daily		1910			
1,013	Tubercular	Arsenious iodide	$\frac{1}{50}$ gr. increased later to	Each salt	Sept. 15	8½ months	+	No improvement.
		Mercuric ,,	$\frac{1}{50}$ gr. $\frac{1}{15}$ gr. of each salt	16 gr.				
1,104	,,	Arsenious acid	By mouth, $\frac{1}{30}$ gr. later to $\frac{1}{3}$ gr.	41 ,,	Sept. 15	8½ ,,	+	,,
1,308	Mixed	Anhydrous Sod. arsenate	,, ,,	40 ,,	Nov. 1	7 ,,	+	No improvement. Worse.
636	Anæsthetic	Arsenious acid	,, ,,	38 ,,	Sept. 15	8½ ,,	+	No improvement.
			Hypodermically					
1,228	Mixed	"Soamin" *	5 gr. thrice weekly	390 ,,	,, 25	6 ,,	+	Worse.
1,134	Tubercular	"Soamin"	,, ,,	390 ,,	,, 25	6 ,,	+	,,
1,198	,,	"Orsudan" *	,, ,,	350 ,,	Dec. 2	6 ,,	+	No improvement.
1,293	,,	"Orsudan"	,, ,,	180 ,,	,, 6	3 ,,	+	Much worse.

F.—Calcium Chloride, Calcium Iodide, and Mercuric Iodide.

Patient's number	Variety of disease	Drug	Daily dose (average) by mouth	Date of commencement of treatment	Period of treatment	Total quantity of drug consumed	Presence of L. bacilli after treatment	Result.
1,088	Tubercular	Calcium chloride	10 gr.	Feb. 18, 1910	2 months	510 gr.	+	Worse.*
621	,,	Calcium iodide	10 ,,	April 4, ,,	6 ,,	1,500 ,,	+	Worse.
630	,,	,,	10 ,,	,, 4, ,,	8 ,,	2,440 ,,	+	No improvement.
624	,,	,,	7 ,,	Feb. 17, ,,	4½ ,,	447 ,,	+	Worse.
598	,,	,,	10 ,,	,, 17, ,,	4½ ,,	1,350 ,,	+	Worse.*
1,136	,,	,,	15 ,,	Jan. 28, 1911	8 ,,	3,577 ,,	+	Worse.*
1,276	,,	Mercuric iodide	$\frac{1}{16}$,,	June 1, 1910	12 ,,	23 ,,	+	Worse.*

* See below.

frequently been tried in leprosy, but instead of helping to arrest the progress of this disease, or of assisting in curing its open sores, or of aiding the absorption of morbid cellular accumulations, it seems rather to aggravate every phase and symptom. One hesitated, however, to discard so valuable an adjunct to medicine without trial of a modification. I therefore experimented with the calcium equivalent. It undoubtedly had a pernicious effect which one need not hesitate to ascribe to the iodine constituent. It is not without significance to observe that the cases marked (*) in the above table have since succumbed. All compounds of iodine, in my experience, are harmful in leprosy. They reduce the patient and accelerate the disease. Chloride of calcium proved likewise of no avail. The iodide compound of mercury, so useful in the venereal complaint, had also a noxious action. The baneful effect of thyroid gland in leprosy I have ascribed above to the high percentage of iodine in the thyroalbumen, though this percentage is subject to considerable variation.

G.—Various Drugs.

I cannot give any definite or succinct reasons why I was led to try metals like lead and silver in the hope of relieving the disease. Silver accumulates in the tissues and remains a long time in the economy. Many of its salts are excellent antiseptics. It was perhaps the fugitive hope that saturation of the tissues with the chloride or other combination might bring about a direct inhibitive action on the growth and activities of the bacillus. The exhibition of the drug was pushed to the limit of tolerance, but without observable action on the disease. These remarks also apply more or less to the use of lead. This metal has a profound injurious effect, leading to degeneration of the peripheral nerves and central nervous system; to inflammatory changes in all the great glands and systems, and far-reaching biochemical alterations. The dangers of treatment in this, as in all cases, were explained to the patient, and I take the opportunity of recording the fact that in no case, even when serious bodily injury was a probable result or life itself endangered, was I met with a refusal. Patient No. 1177 was gradually brought under the influence of the lead salts until in a few months' time he was taking daily the large dose of 4.25 gr. of the acetate and oxide. He suddenly

G.—Various Drugs.

No. of Patient	Variety of disease	Drug	Quantity and mode of administration	Date of commencement of treatment	Total period of treatment	Presence of bacilli after treatment	Total quantity of drug consumed	Results
1,177	Tubercular	Lead	By mouth. Began with ¼ gr. pb. subacetate daily, increased to 2·5 gr. acetate + 1·75 oxide pb. daily	1910 June 1	6 months	+	Pb. subacetate, 48 gr.; pb. acetate, 112·5 gr.; pb. oxide, 78·5 gr.; total salts pb. 239·0 gr.	No improvement.
1,224	,,	Silver	Oxide in pills, 2 gr.; later 4 gr. and more daily	,,	6 ,,	+	680 gr.	,,
382	,,	,,	Oxide in pills, 2 gr.; later 4 gr. and more daily	March 22	13 ,,	+	1,270 gr.	Improvement.
780	Mixed	Quinine	Hypodermically 5 gr. sol. bisulphate tri-weekly	June 1	4 ,,	+	240 gr.	No improvement.
621	Tubercular	Radium Bromide	15 mg. in 3 glass tubes, directly applied to cutaneous surfaces	Dates of series of applications: May 2, 1911, Sept. 9, 1911, Dec. 6, 1911		+	Ultimate local improvement.	

developed an acute degeneration of both his eighth (8th) nerves, an encephalopathy with serious and repeated epileptiform seizures and other associated phenomena of a dangerous toxæmia. The drug was stopped and he gradually recovered without hindrance except the deafness. Although every organ was saturated with the drug with wide cellular injury, the elusive lepra bacillus displayed a callous indifference, and remained apparently totally unaffected. The quinine, after four months' use, was rapidly depressing the patient, without benefit to the disease; it was therefore discarded.

Radium was supplied in three tubes, 2 in. long, of violet glass, each containing 5 milligrammes. It could obviously be only applied locally. The full details of these applications it were beside the mark to expatiate on here. In brief, however, it was found that the fixation of a tube containing 5 milligrammes of the bromide for twelve hours continuously to a suitable cutaneous site showing well marked and diffuse leprotic infiltration was followed as a rule by no reaction; very occasionally there was a subsequent transient erythema. A continuous twenty-four hour application was followed by a distinct circumambient erythema culminating on the seventeenth day after, on an average, in a small definite vesication and necrosis. The exact site of the ulceration was invariably where the lower extremity of the tube impinged on the skin—no doubt because the contents during movement mainly gravitated there. A seventy-two hour continuous application showed an immediate severe reaction. On removing the tube the inelastic and slightly œdematous skin displayed a slight impression of the tube. It was surrounded by a broad area of erythema. At the extremities of the impression were blisters, small but distinct. Three days later these vesicles had become purulent and covered deep erosions. Thirteen days after removal of the radium there was a deep lineal ulceration corresponding to the position of the tube. The ulceration, however, extended laterally and longitudinally beyond the dimensions of the original mechanical impression. One month after date of application there was a long, wide, indolent necrosed area covering approximately nearly one half the posterior surface of the forearm where the tube had been fixed. It was 6 in. long and on an average 2 in. broad. Shortly afterwards it showed signs of healing, but it was not till six months had elapsed that the surface had again become entirely covered with epithelium. The necrosis at no time penetrated entirely through the true skin.

All immediately local leprotic manifestations had disappeared or were in abeyance, and bacilli, dead, deteriorated, or otherwise, were not demonstrable in the immediate vicinity. Various modifications of these applications were made, such as fixing the three tubes of 5 milligrammes in slots separated by varying distances cut in a piece of wood and moving the wood with its inset tubes systematically and for definite times to different suitable areas. It would have been much better if the radium had not been distributed in tubes but diluted with an innocuous powder and spread over a large surface in a rubber or similar medium; this would have permitted the wrapping up of part or the whole of a limb and the subjecting of this area to a weaker, more prolonged, accurate, and homogeneous exposure.

Reviewing the results of these applications after the lapse of twelve months, and similar experiments *in vitro*, it seems that radium has a definite inhibitive action on the vitality and growth of the lepra organism; that *in corpore vili* no benefit was observed from these applications unless they were continued so long as to lead to severe local devitalization of the tissues of the host; the bacilli seemed to have as much resisting power, or to be no more susceptible to the action of the rays, than the cells among which they lived; that the destructive effect on the bacillus and its manifestations was strictly local and probably transient; the activity of the radium was no doubt due to the so-called β and γ rays. For these reasons, then, radium as an external application and in the form supplied is of no practical value in the treatment of leprosy.

H.—Chaulmoogra Oil.

I now come to a treatment undoubtedly slow, and not very satisfactory, but in my experience superior to any other known remedy or reputed cure for leprosy, namely, the vigorous and prolonged use of chaulmoogra oil. I submit two tables. The first shows a number of patients who have taken the oil diligently by mouth for a number of years. In the opinions of all concerned they are improved to varying degrees. It must not be considered that every patient who used the oil was benefited by it. Many who originally took it, finding no change or getting worse, lapsed from its use. Many are not present to record condemnatory evidence. But allowing for all derogatory factors, and for that percentage of lepers (about 10) whose disease becomes naturally arrested, I believe from 30 to 40 per cent. of the patients, at a low estimate, who use chaulmoogra oil continuously and conscientiously are markedly improved, and many approximate a cure.

The second table shows a series of patients where hypodermic injections of the oil were tried, in addition to oral administration. All patients using the oil supplemented its internal use by occasional vigorous inunction.

The first table represents a series of patients collected through the wards who have benefited to a greater or less extent by the oral administration of the oil. Many of them are in an astonishingly healthy condition, and have remained so for years, though showing traces of the previous activity of the disease.

Patients treated by hypodermic injections of the oil suffered occasional lapses from indisposition, from saturation with oil when the subcutaneous deposits of oil were very slow of absorption, or from other incidental distraction which led to temporary suspension of treatment. It is important to recall

CHAULMOOGRA OIL—ORAL ADMINISTRATION.

Patient's number	Variety of disease	Period of treatment	Average daily dose	Remarks
1,185	Tubercular	3 years	9 to 50 capsules*	Slight improvement.
1,012	,,	2 ,,	,,	Considerable improvement.
720	,,	7 ,,	,,	Approximates cure or arrest.
1,232	Mixed	2 ,,	,,	Considerable improvement.
985	,,	7 ,,	,,	,, ,,
1,204	Tubercular	1 ,,	,,	Great improvement, almost arrest.
726	,,	2 ,,	,,	Considerable improvement.
603	,,	6 ,,	,,	Slight but definite improvement.
404	,,	3 ,,	,,	Considerable improvement.
564	Anæsthetic	4 ,,	,,	,, ,,
347	Tubercular	4 ,,	,,	Greatly improved, approximate cure.
214	,,	7 ,,	10 to 60 capsules	,, ,,
146	,,	8 ,,	2 tablespoonfuls	,, ,,
984	Mixed	2 ,,	2 to 50 capsules	Slight improvement (?)
971	Tubercular	4 ,,	,,	Great ,,
819	,,	9 ,,	,,	Great ,,
856	,,	2 ,,	,,	Slight ,,
1,095	Anæsthetic	2 ,,	,,	Considerable improvement.
630	Tubercular	7 ,,	,,	,, ,,
213	Anæsthetic	8 months	,,	Slight improvement.
1,172	,,	3 years	,,	Great ,,
1,115	Mixed	2 ,,	,,	Considerable improvement.
1,198	Tubercular	1 year	,,	Slight improvement (?)
1,138	,,	1 ,,	,,	,, ,,
1,342	,,	1 ,,	,,	Considerable improvement.
1,029	,,	1 ,,	,,	Great improvement.
241	Anæsthetic	1½ years	,,	(?)

* Capsules contained 5 minims.

CHAULMOOGRA OIL—ADMINISTERED ORALLY AND HYPODERMICALLY.

(*Treatment continued to date.*)

Number of patient	Variety of disease	Average dose *per os* daily*	Average dose hypodermically in cubic centimetres†	Frequency of injections	Total number of cubic centimetres injected	Period of treatment with injections	Comments
1,039	Tubercular	6 to 10 capsules	4.5 c.c.	Twice (later three times) weekly	421 c.c.	1⅔ years	Greatly improved. Disease almost arrested.
710	,,	6 to 10 capsules	3.8 ,,	Twice (later three times) weekly	552 ,,	,,	*In statu quo ante.* No worse.
734	Anæsthetic	5 capsules	3.5 ,,	Twice (later three times) weekly	473 ,,	,,	Disease apparently arrested.
1,017	Tubercular	6 ,,	4.25 ,,	Twice (later three times) weekly	469 ,,	,,	No improvement.
415	,,	...	4.50 ,,	Twice (later three times) weekly	598 ,,	,,	Disease practically arrested.
1,146	,,	...	4.25 ,,	Twice (later three times) weekly	353 ,,	,,	Recommended to be discharged cured by last Commission.
1,014	,,	...	4.50 ,,	Twice (later three times) weekly	495 ,,	,,	Slight improvement.
382	,,	...	7.75 ,,	Three times weekly	1,017 ,,	,,	Considerable improvement.
628	Anæsthetic	...	4.50 ,,	,, ,,	625 ,,	,,	Great improvement. Disease quiescent.
605	,,	...	4 ,,	,, ,,	528 ,,	1½ ,,	Discharged cured.
617	,,	...	3.75 ,,	,, ,,	132 ,,	4 ,,	Transferred to Bloemfontein. No information.
630	Tubercular	...	5.50 ,,	,, ,,	266 ,,	5 months	Considerable improvement.
636	Anæsthetic	...	5.50 ,,	,, ,,	277 ,,	,,	,, ,,
1,013	Tubercular	...	5 ,,	Twice weekly	133 ,,	,,	Not much changed so far.
407	Anæsthetic	...	4 ,,	,, ,,	166 ,,	,,	,, ,,
621	Tubercular	...	3.5 ,,	,, ,,	195 ,,	,,	No improvement. Worse.
446	,,	...	446 and 618	do not take oil hypodermically. Introduced in this table by error			Considerable improvement.
618	,,	...					Leprosy improved. Serious complications.
583	,,	...	5 c.c.	Three times weekly	216 c.c.	5 months	No change yet.
572	,,	...	6 ,,	,, ,,	296 ,,	,,	Improved considerably.
642	,,	...	5.25 ,,	,, ,,	244 ,,	,,	Improved.
606	,,	...	6.25 ,,	,, ,,	135 ,,	,,	,,

* 1 capsule contains 5 minims or drops. † 1 c.c. = 16 drops about.

that some of these patients would probably have improved without any treatment. Again, that improvement, even for periods of eighteen months, does not necessarily indicate the beginning of an uninterrupted progression to a cure. Some may unfortunately relapse and lose more in a few weeks than they have gained in so many years, for a great feature of this disease is the extraordinary fluctuations in its evidences of activity. (Such fluctuations I personally associate with proliferation of bacilli in an apparent or cryptic tubercle, rupture into a blood-vessel, or large lymphatic channel, with bacteræmia, disseminations and impaction in widely distributed capillaries leading by local bacillary growth to the rapid formation of new tubercles and a consonant general reaction.) Improvement, at any rate, points towards cure, and stimulates that most essential feature, the mental attitude. I shall not enter into a metaphysical discussion on the influence of mind on matter, but certainly, in combating leprosy, the salutary effect of hope should never be left out of consideration. It is a *sine quâ non* in the treatment. I hesitate to ascribe any exact value to the hypodermic injections of chaulmoogra oil. It seems to assist slightly, particularly in those individuals who have to limit to small quantities the consumption of oil per os on account of gastronomic sequelæ. It is doubtful if the increased benefit, allowing such, received from the injections at all compensates for the pain and inconvenience occasioned by this heroic method of administration. One is compelled here to pay tribute to the stoicism, fortitude and courage of the patients in undergoing this severe and protracted treatment.

At the risk of being tautological, may I emphasize that the use of the oil must be prolonged, five years or more; it must be as far as possible continuous, and the imbibition of the oil should be pushed gradually to the extreme of receptivity. Relapses will undoubtedly occur, particularly in the earlier stages, but such should not be permitted to foster discouragement. To expect sudden amelioration is to look for disappointment. Surgical assistance should always be ready to intervene where natural processes or medical applications have failed in discarding devitalized food or opposing inflammation. The value of surgery in the treatment of leprosy cannot be over-estimated. It is an essential. In view of the eulogistic terms which I have employed above concerning chaulmoogra oil, until a more efficient substitute is evolved I believe it were well that all new arrivals be briefly and lucidly instructed as a matter of course in the principles of oil consumption and inunction. That written instructions in English or Dutch or Kaffir be handed to them for perusal and consideration at their too abundant leisure; and that their attention be directed for further advice and sympathetic counsel to patients of their own race who have benefited and are encouraging examples of the value of chaulmoogra oil.

SOME NOTES ON LEPROSY IN SOKOTO PROVINCE.*

By JOHN M. DALZIEL, M.D., B.Sc.

Medical Officer, Sokoto.

NATIVE BELIEFS. HEREDITY.

THE natives do not profess to know the cause of leprosy, but believe that it exists in the blood at birth; it may appear years afterwards as the result of improper food, &c. This suggests an appreciation of the influence of heredity. Puberty is supposed to be the period when the symptoms are likely to appear, but while some declare that it may be latent as long as sixty to seventy years, others deny this.

In this district all are agreed that the children of lepers are immune, but that those of the following generation frequently show the disease usually within six to nine years, or at puberty. In illustration it is stated that if a child of healthy parents is carried on the back of a leper slave-girl the child will become a leper. (It is added that the disease will appear in the parts in contact with the girl's body.) If, however, the child is the offspring of leper parents he will not become a leper. The reason why the succeeding generation acquires leprosy is supposed to be that an alien strain of blood is necessary in order to bring leprosy hereditarily acquired to the surface. Again, a person born of leper parents does not fear to handle leprous sores, &c., believing himself immune, though his children are susceptible.

This curious belief in *atavism* (which is, of course, common in many countries in regard to leprosy) is not universal in Hausa-land. From Kano eastward the sons of lepers, however well dressed and healthy, are generally saluted by their acquaintances when they meet, and given a nominal alms of two or three cowries in the superstitious hope that the fates (or hereditary taint) may pass them over.

The native belief in heredity is also shown by the fact that in Eastern Hausa provinces, and in Adamawa and Bornu, the better classes do not allow marriage with the son or daughter of lepers, or of the blind, or of the butchers (either owing to their trade in blood or from some early Mohammedan tradition).

CONTAGION.

In regard to contagion, native belief is much less definite. It is obvious that, for the most part, little heed is paid to the presence of lepers in markets, &c., where they freely mingle with the people, and may even be seen selling articles of food.

The question whether a man who marries a leper woman (or *vice versa*) becomes in time a leper is disputed, and has given rise here to heated debate, some denying the occurrence, while others point

* Reprinted from the *Northern Nigeria Medical Report for* 1910.

to actual cases. Many intelligent natives in all the Hausa provinces believe that leprosy may be acquired by intercourse with a leper woman, a belief which has much acceptance in the Pacific, and is widely held in perhaps all countries where leprosy is endemic. Infection by intimate contact, such as that mentioned of a child carried on the back of a leper, is given due credence.

It is quite certain that the idea of isolation in some degree not only commends itself to the native minds, but is in many parts of Hausa-land and other parts of West Africa carried out by themselves. In Kano there is a tendency to segregate lepers in the neighbourhood of the hill Dala within the town. East of Kano it is not uncommon to compel lepers, with their families, to remove to the bush and form farms for themselves. Cases in the early stage of erythematous patches, &c., though often recognized as lepers, are not thus segregated.

The Yorubas believe mainly in direct contagion from person to person, but admit other causes, such as wrongly administered medicines, &c. Their practice is to drive lepers to the bush, and in former days young lepers were even killed. Now, however, it is common to isolate lepers in the bush, and even to treat them and admit back to the community those who appear to be cured.

Food and other Theories.

There is no evidence that any native traces leprosy specially to dried or preserved fish. There exists, however, a wide belief in the connection between food and the disease, *e.g.*, (1) bad, dirty, or contaminated food in general; (2) unclean or contaminated utensils; and (3) particular articles of food. In regard to (1) and (2), no definite ideas can be mentioned. There is a fairly widespread belief amongst Hausas, however, that the "*Kulba*" lizard (or skink—*Mabuia Perrottetii*—a smooth red-bodied species) is capable of causing leprosy, according to some by its bite, and according to others by accidentally fouling food or cooking utensils, water-jars, &c. With this may be compared the belief of some people in Eastern Hausa that if a "*Kulba*" lizard is eaten accidentally by a fed bull, the latter grows inordinately fat, but the flesh and tripe of that animal will be avoided by those who know the circumstances, in the belief that they cause leprosy.

The *Torunkawa* (the local Fulani people of the higher ranks in Sokoto town and district) have some quite peculiar beliefs in regard to the relation of food to leprosy. Persons with a hereditary taint of leprosy, or those already showing early symptoms, are believed to have the disease brought out or aggravated by certain well-defined articles of food. These are:—

(1) "*Kulumi*," a black species of barbel.

(2) "*Rembeshi*," also a fish of the barbel tribe. (This species is not found in the waters near Sokoto town, but is known in places not many miles distant.)

(3) "*Kififia*," the mud turtle.

(4) The goat—whether milk or flesh. (This suspicion attaches by no means solely to the male goat.)

(5) The fish called "*Robai*." This is a narrow fish of lizard-like shape and smooth skin, and is supposed to be a transformed "*Kulba*." It is avoided as food by those who know it.

Leprosy is common amongst the *Torunkawa*, and the better informed amongst them do not eat those varieties of fish on account of their supposed connection with leprosy. The more careful amongst them also avoid dried fish, for the reason that one cannot be certain that it is not one of the suspected species. Any well-disposed person who sees the "robai" exposed for sale, or recognizes it in the dried form, will seize it and throw it away. Many of the *Torunkawa*, however, eat dried fish freely, and fresh fish of other species.

The other Fulani tribe of the district, the *Sulubawa*, eat fish freely, as well as the other articles of food prescribed by the Torunkawa, and are said to suffer less from leprosy. This requires verification.

The *Torunkawa*, as a rule, do not buy meat exposed for sale in the market unless they are sure that it is not mixed with goat's flesh. For this reason the tail of a sheep is sometimes seen laid beside the meat on the market stall to indicate its origin, but this is a form of fraud which is well recognized in Hausa markets.

Similarly in regard to milk the *Torunkawa* as a rule avoid that sold in the market in case it is adulterated with goat's milk, but use both milk and flesh of the cow and flesh of the sheep in their own homes. Many of these people even extend the *taboo* to chicken and guinea-fowl except when raised at home.

The *Borroro* Fulani in the bush live chiefly on the products of the cow and are said to have little leprosy, and they probably rarely eat fish except that which they catch themselves in bush streams, but dried fish when opportunity offers at a market.

How fatuous some of the native beliefs are is suggested by the fact that in Kordofan goat's milk as the sole diet for forty days is the recognized method of treating leprosy.

According to native ideas it is apparent that heredity is the really important factor, and articles of food and other factors are considered to operate chiefly on those who are believed to have an hereditary taint. This qualification extends in some degree even to the possibility of direct contagion. The habit of the Torunkawa of this province in regard to fish eating might be construed either for or against the fish theory, but it will be observed that *Sokoto District* shows (*vide* statistical table) with one exception the lowest proportion of lepers in the *division*. It would appear that even if the native mind incriminates fish, it is fresh fish and not the half-cured article which is suspected. The native method of preserving fish is not, as a rule, by salting, but by smoking by

means of fire under a low wicker platform on which the fish is laid. Fish thus imperfectly preserved is generally, but not always, eaten without further cooking. All varieties of fish are at times thus treated, from the small species resembling all white-bait to the giant perch and even crocodile flesh. Along the Benue this industry is one of the commonest sights during the dry seasons, and it will be interesting to compare the incidence of leprosy in the riverine provinces with that found in these further north.

Native Terms.

There is little doubt that the natives are able to recognize the symptoms of leprosy at an early stage, though a natural fear prevents the patient or his people declaring the fact. Quite recently I have had to pronounce a definite opinion on a case which showed no other symptom than two small anæsthetic patches of erythema, yet the person had for some time been suspected by his neighbours to be a leper.

Dafe is the term applied to the early macular stage of erythematous and anæsthetic patches when sufficiently well defined to attract attention.

The term *Zafi* alone is vaguely used of persons suspected, often correctly, of being lepers in an early stage. It corresponds (when used of this disease) more or less with the period of prodromal symptoms with general weakness, feverish attacks, obvious ill-health, pains or peculiar sensation, &c., in the skin, and the less defined types of skin eruption.

Bakin Zafi ("black or perhaps suppressed inflammation") is the special term for obvious *nodular* or *tubercular* leprosy, while *Kuturta* is the general Hausa name for the disease, and is the only term used for the classical types of deformity which result from *nerve leprosy*.

Native Treatment.

In regard to native treatment of leprosy nothing of any value or even in the least suggestive of suitability can be mentioned. Many different plants could be referred to which are in use in different localities and are practically always combined with faith in written charms obtained from a mallam, or are compounded as a brew with the washing of portions of the Koran written on a mallam's tablet. The *Torunkawa* are again peculiar in having a preventive treatment of their own, viz., a cold infusion of the leaves of the *Sabara* (a common shrub, *Combretum sp.*) taken daily as an evening draught. This is said to be an indispensable preventive used by all the tribe and commenced at birth. The practice of blood-letting used for leprosy in some other parts of the Soudan, and in this country for various diseases, is not used here for leprosy from observation of the fact that wounds in a leper do not readily heal. I attach a table of the population of lepers in the various districts of *Sokoto Division*, as such figures may some day be of use for comparison with those of other provinces. It will be seen that no less than 16 districts out of 46 show a proportion of over 100 per 10,000 of population, and of these three districts have over 200 per 10,000 (*Kwarre* 236.4, *Dinawa* 224, and *Zurmi* (203), whereas in only two districts does the figure fall below 20 per 10,000 (Gummi 17.6 and Sokoto town and district 17.7).

The populations are those of the assessment papers of March, 1910. The number of lepers is probably under estimated, but the same may perhaps apply to the enumeration of population for purposes of assessment. No comparison of the three *Divisions* of the province (*Sokoto*, *Gando* and *Argungu*), in regard to tribal and social differences is possible at present. The number of lepers per 10,000 of population is:—

In whole *Province*	52.
In *Sokoto Division*	53.2
In *Gando Division*	49.2
In *Argungu Division*	37.6

The proportion of female to male lepers over the whole province is about two to three. In India this figure is two females to five males, and in Japan two to 4.6. In three districts the female lepers exceed the males. Sokoto town contains 117 lepers, *Jega* 64, *Gando* 36, *Illo* 30 and *Birnin Kebbi* 21.

The total number of lepers in the province is so large (nearly 6,600) that it is obviously beyond the powers of the native administration to deal with them satisfactorily, and short of such large measures of effective segregation and treatment as can be afforded by Government institutions, it is doubtful whether much is to be expected.

A NOTE ON THE TRANSMISSION OF LEPROSY.*

By Edward C. Long.

Principal Medical Officer, Basutoland.

The means by which the leprosy bacillus is introduced into the human body have not yet been definitely established.

Commensal feeding, direct inoculation or contagion have been generally accepted as being the most likely methods of introduction, but no proof of either of these methods has yet been adduced, and I believe the leprosy bacillus has hitherto not been found outside the human body.

The fact that leprosy is most common among people of unclean personal habits and living in unhygienic surroundings, points to some co-existing source of contagion.

The possibility of the bacillus being carried by vermin occurred to the writer. With a view to testing this hypothesis bed-bugs obtained from huts which had never been inhabited by lepers were caused to bite lepers in the neighbourhood of leprous

* From the "Medical Report for Basutoland for 1910."

nodules on the face. The bugs were then killed and the alimentary track and its contents examined. In every bug that bit freely a bacillus was found which in shape, size, and staining reactions is similar to the *Bacillus lepræ*.

Control bugs from the same hut gave, in every instance, a negative result.

The experiments are still in progress and it is intended, as soon as circumstances permit, to solve the following questions:—

(1) How long the bacilli remain in the bug's body?

(2) If bugs which over a period of weeks have fed on the blood from leprous nodules present any evidence of growth of bacilli in their tissues.

(3) What organs of the bug contain bacilli?

(4) Whether any other vermin, *e.g.*, fleas and lice, contain bacilli.

These experiments are only regarded as preliminary to a thorough investigation of the subject, but the question is so important that I have ventured to record my results in the hope that other observers may be induced to experiment on the same lines. I think it will be found that lepers may be inoculated by infected bugs, and this point can be elicited by causing infected bugs to bite lepers on parts of the skin on which there are no leprous lesions.

If my hypothesis is correct a great many facts regarding the spread of leprosy which have hitherto been inexplicable would be made clear.

Inquiries into the past history of certain lepers go to show that they could only have become infected with leprosy through some intermediate host.

The fact that plague is carried by fleas warrants, at any rate, the inference that leprosy may possibly be carried by bugs. Further, the fact that only a percentage of human beings are attacked by the bed-bug, or, for the matter of that, by the flea, would serve to explain why it is that only some of those people who live in close association with lepers become lepers also.

All lepers that I have questioned admit that bugs bite them freely, and it is not unreasonable to assume that such a voracious feeder as the common bug must, in the course of his nightly meal, ingest a considerable number of leprosy bacilli if his bites were in the neighbourhood of leprous nodules, which are often swarming with the *Bacilli lepræ*. If such infected bugs were to bite a non-leper there would be a good chance of the bacillus being introduced into his system.

The following history of a recent case of leprosy is only explicable by assuming some method of infection as suggested above.

A native, X, residing in a village about three miles from Maseru presented himself as an out-patient about three months ago with some well-marked tubercular leprous patches on the face. They had appeared about six weeks previously. There are no lepers in his village and none of his relatives are lepers. Inquiries as to how he had spent his time and where he had been during the preceding year elicited the fact that he had during that period visited on three or four occasions a village about fifty miles away, where there was one leper, who was, however, driven from the village during the period in question. He had been in the leper's hut, but had never partaken of food there. After the leper had been driven away, X spent one night in the hut and was severely bitten by bugs there.

The closest questioning failed to elicit any further evidence of contact with lepers or their dwellings, and one is almost forced to the conclusion that X was inoculated by leprosy-infected bugs or other parasites on the one night he spent in the infected hut.

"Bulletin of Entomological Research," vol. ii, Part 4, pp. 279-374, January, 1912.

THE above number contains some very interesting papers. "New African Species of Tabanus," by E. E. Austen; "Notes on the Preliminary Stages of *Glossina morsitans*," by Allan Kinghorn; "Colour Conventions to Indicate the Distribution of Blood-Sucking Insects and the Diseases they Transmit," and "Entomological Research in British West Africa," by J. J. Simpson; "Observations on the Breeding Haunts of *Glossina morsitans*," by R. W. Jack; and "On a New Genus and Species of *Clinocoridæ* (*Cimicidæ*) from Uganda," by the Hon. N. C. Rothschild. Mr. Simpson's article on his entomological research work in Northern Nigeria affords most interesting and instructive reading, and the photographs which illustrate his text are really splendid, and give an excellent idea of the country traversed. Other good photographs illustrate the breeding grounds of *Glossina morsitans*. These will be found in Mr. Jack's paper.

"The Journal of Experimental Medicine," February 1, 1912.

Variations in Treponema pallidum.—Noguchi, going on with his artificial cultivation of the *Treponema pallidum*, believes that it is now possible to consider the question of differences in strain among the species, differences that may even amount to racial variations. He summarises his conclusions as follows:—

"When many cultures of *T. pallidum*, whether obtained from the testicular lesions produced in rabbits or directly from human cases of syphilis, are compared, certain definite differences in morphological character become apparent. The different specimens can be divided into thicker and thinner forms or types, and an average or normal form or type. The last is the common or most frequent variety, but the other two occur with sufficient frequency and retain their characters with such constancy as to constitute distinct varieties. Indeed, two of the varieties—the average and the thinner—occurred in association in a chancre and were separated afterwards in cultures. The gross cultural properties of the three varieties present no points of distinction.

"The lesions caused in the testicle of the rabbit differ according to the variety inoculated, and consist either of a diffuse or of a nodular orchitis. This is a highly important distinction, and if, in the study of a still larger number of specimens of pallida, it is maintained, it is capable of throwing light on certain important clinical features of the human syphilitic disease.

"The thinner variety of *T. pallidum* resembles in morphology *T. microdentium*, from which it is unmistakably distinguished by cultural characters.

"The morphological and pathogenic variations in cultures of the pallidum may constitute racial differences within the species."

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THE JOURNAL OF

Tropical Medicine and Hygiene

MARCH 1, 1912.

OUR KNOWLEDGE OF LEPROSY.

THE several references to leprosy in the present issue of THE JOURNAL show that the subject is receiving a great deal of attention at the hands of both clinicians and scientists. This, the most ancient of diseases of which we have an exact account, continues its hold on the world, and prevails practically pandemically, in spite of prophylactic regulations and active treatment. At the present time attention is being given to the cultivation of the *Bacillus lepræ* and to establishing a complete cycle of experimental inoculation investigations. In all processes, however, yet recorded, the cycle of tests and experiments seems to fail at some point, and whilst left in admiration at the patience and scientific acumen of the observers, we are still not satisfied that final conclusions have been arrived at.

Leprosy has been, and is being, discussed from many aspects. The heredity, communicability, epidemiology, etiology, pathology, and treatment have been dealt with from the earliest times until the present day, and it cannot be said that any one of these has been definitely settled. Heredity is still discussed, and arguments for and against are brought forward. The general belief is that, were the infants of lepers separated immediately from their mothers, the chances of the infants developing leprosy in later years would be infinitesimal.

Communicability is again regarded as so slight a danger that many consider it a myth, and would do away with all attempts at segregation as unnecessary and unscientific. Tradition, or, in other words, experience, is against this, and the instinctive avoidance of persons afflicted with leprosy is too deeply founded to be cast lightly aside as a mere superstition.

Although doctors have handled lepers with impunity, and therefore concluded that leprosy is not contagious, this does not settle the matter. Handling lepers at a clinic and living in close contact with them are totally different conditions, and the many instances of the disease being communicated by sleeping in the same bed with a leper, or attending to a leprous member of the family in the way of rubbing in ointments, &c., are too many and positive to be disregarded. On the other hand, prolonged and intimate contact does not always end in the healthy being attacked. The writer saw in the leper village in Canton a woman, who dwelt amongst the lepers, who had had three leper husbands, and yet, at the age of fifty-five, was quite free from the disease. In spite, however, of this and other evidence of non-communicability, the fact of leprosy being contagious has not been disproved.

Epidemiology.—Leprosy is, or has been, known amongst all peoples on the earth, and at the present moment none can be said to be wholly free from it. In Britain leprosy was once rife; then it was considered to be wholly absent from the country, and yet to-day is the public press in England raising the alarm that leprosy is amongst us once more. The fact is it has probably never been wholly absent, but went unnotified, or perhaps unrecognized.

The question of communicability to animals has been denied, but on the other hand it has been held to be proved by experiment. The rabbit and the rat have both been successfully inoculated with the disease, but the cycle of communicability, so far as present observations show, ends there. The bed bug is held responsible for the transmission of the disease, but this point also requires further confirmation, although Dr. Long's evidence on this point (p. 72) appears convincing.

The etiology of leprosy, in its widest sense, is ascribed to the presence of a specific bacillus, although, even this point has been questioned, and the bacillus regarded as the result and not the cause. The same argument, however, has been applied to almost every form of infection and in our present-day belief must be disregarded.

Segregation occupies a prominent place in discussion amongst leprologists to-day. Leper asylums

are by some regarded as unnecessary, and as a stigma upon our application of scientific investigations and observations; whilst others, equally eminent, believe in the rigid isolation of lepers in order to prevent the disease spreading.

In the field of treatment perhaps more than any other are opinions at variance. The different remedies in use are manifold, their very number serving to show the lack of exact knowledge of how to treat leprosy. To-day one remedy is in vogue, another takes its place in due course, only to be again set aside; it is evident there is no specific treatment for this disease.

Nothing, in fact, is definitely settled concerning leprosy in whatever aspect the phases or phenomena of the disease are examined. Empiricism rules in almost all that appertains to the disease; except the presence of the *Bacillus lepræ* all else seems indefinite. There have been investigations in plenty; earnest work is being carried on now; and we await the results with keen anticipation and hopes that this most ancient of ailments may be at last understood. The development of the symptoms of leprosy varies; in one region the disease seems to advance rapidly, in another slowly. In a year or so the leprous signs and symptoms progress to an extent sufficient to exclude the sufferer from the company of his fellow-men; on the other hand, during five or more years the fact that a person has leprosy is indicated by a few numb patches in the legs, some thickening of nerve-trunks, loss of eyebrows, and here and there some slight changes in the appearance of the skin. In South America leprosy is looked upon as a mild form of disease, and is not regarded with the dread in which it is held elsewhere. The slow or rapid development of leprosy in infected persons depends almost altogether upon environment and social position. Amongst the well-fed and sufficiently clothed, especially those who lead an open-air life, leprosy is of a mild form, and may remain in abeyance during natural life; but amongst the poor and destitute dwelling in unhygienic and overcrowded dwellings the disease advances rapidly.

The rational treatment of leprosy is the same as that for tuberculosis, namely, hygienic and open-air life, with good food. Under these conditions, as in tuberculosis, lepers improve, and the disease would appear to be kept in abeyance.

J. CANTLIE.

Annotations.

Transmissibility of Leprosy to Animals.—Bayon, in his article on the transmission of leprosy to animals by direct inoculation, published in the *British Medical Journal* of February 24, 1912, gives a very excellent review of the work done on grafting lepromata to animals direct from human cases. As far as Bayon can gather from the literature, the positive results that have been recorded are as follows:—

1881.—Neisser, after twenty-four unsuccessful attempts on rabbits, injected two dogs with leprous nodules, and concluded from the results that leprosy developed locally at the site of inoculation.

1883.—Damsch grafted lepromata in the anterior eye chamber of two rabbits. The animals died after 139 and 219 days. Apparently a slight increase in the quantity of acid-fast germs had taken place. He also inoculated two cats in the abdomen with leprous nodules. After 120 days numerous bacilli were found in the newly-formed tissue round the atrophied nodules.

1888.—Vossius carried out experiments in a similar fashion to Damsch on rabbits, and had identical results. He also considered that the acid-fast germs had multiplied.

1885-6.—Melcher and Ortmann inoculated four rabbits in the same way. They succeeded in getting, after four to ten months, definite metastases and deposits of acid-fast germs in the spleen, liver, cæcum, pleura, and pericardium. They stained these germs with Baumgarten's differential stain, and found that they had the staining properties of Hansen's germ.

1887.—Wesener injected several rabbits with leprous nodules, and in two animals out of eight, after periods of four and a half months and eight months respectively, he found lesions apparently identical with those described by Melcher and Ortmann—that is, nodules from the size of a pin-head to that of a pea in the lungs, on the pleura, on the epiploon, in the liver, in the lymphatic glands, spleen, kidneys, cæcum, and peritoneal surface. Caseation and giant cells were present. In the eyes of the rabbits he obtained after six and eight months a congregation of round cells choked up with acid-fast germs. He considered that the generalized lesions were due to tuberculosis, and that the ocular lesions were caused by dead bacilli, because acid-fast germs can be demonstrated in the eye of the rabbit after inoculation with nodules which have been kept for years in alcohol.

1901.—Barannikow confirmed these results on one rabbit.

1893.—Wnoukow inoculated twenty rabbits with leprous nodules in various fashions (intraocularly, subcutaneously, intraperitoneally). In fourteen rabbits he got lesions which he considered to be of tuberculous nature. No confirmatory tests with guinea-pigs appear to have been made.

1893.—Tedeschi inoculated a leproma into the dura of a monkey. The animal died after eight days; that is far too brief a period for any conclusions to be drawn.

1902.—Ivanow injected several guinea-pigs with leprous nodules. In one case the animal was killed after eight months, and found to have nodules in the epiploon, which Ivanow considered were due to multiplication of the bacilli.

1905.—Thiroux inoculated five rabbits with

leprous material. The animals lived thirteen to twenty months, and presented various lesions at autopsy, which Thiroux considered to be tuberculous.

1906.—Nicolle inoculated monkeys with ground-up nodules, and succeeded in getting localized lesions.

1909.—Marchoux and Borret inoculated a chimpanzee under the skin of the ear with a freshly-excised leprous nodule. It apparently increased in size during three months, and then began to be resorbed. An examination of the blood showed a few leucocytes with badly-staining bacilli. The animal died ninety-six days after inoculation. The nodule had reached the size of a split pea, and under the microscope was shown to consist of three layers. In the middle were the remains of the original tissue, quite necrosed, with a few loose acid-fast germs. Around this was a considerable number of lymphocytes, enclosing numerous bacilli, and at the periphery organized connective tissue with a few cells filled with bacilli. The authors considered that a proliferation of the original germs had taken place.

1909.—Sugai inoculated Japanese dancing mice intraperitoneally with an emulsion of fresh leprous nodules, and found as a result the development of miliary granulomata on the peritoneal lining, especially in the hepatic region and epiploon. Also the bronchial and peritoneal glands showed characteristic leprous lesions. All contained acid-fast germs. The attempt to transmit the disease from these to other mice failed.

1909.—Kitasato appears to have successfully inoculated an orang-outang on the cornea. Only scanty details were, however, given.

1909.—Stanziale reports upon some very careful and thorough experiments on rabbits. In one typical case he inoculated into the eye of the animal a fragment of leproma. During the first few days a marked hyperæmia developed round the opening in the cornea. Soon afterwards a constant diminution in the size of the nodule could be made out, accompanied by the formation of an opalescent exudation, which took its departure from the inoculated piece of tissue and spread out as a fan-shaped segment. After twenty days the nodule became stationary, and remained so during fifteen to twenty days, without any noticeable change taking place. After forty days the nodule began slowly to increase till it had tripled its original size. In the same time small grey nodules made their appearance, and could clearly be distinguished on the surface of the inoculated tissue. These little nodules attained the size of a pin's head. Some appeared to be adherent, while others were loose and independent. After the initial hyperæmia due to the operation had disappeared, a new formation of blood-vessels took place, which spun a delicate network round the piece of tissue inoculated. After seventy days the rabbit's eye was enucleated; part of the tissue was used for histological observations, and the rest was grafted into the cornea of two other rabbits. In one the graft got resorbed without any further results in the course of two months. In the other rabbit the graft began to increase in size after fifty days, and produced similar changes to those described in the foregoing animal. The experiments are being continued by the author, but to date the results obtained are: Thirty-one rabbits have been inoculated, and in eight it was possible to produce leprous ocular lesions. In some of the positive cases the material was taken eighteen to nineteen hours after excision from the patient. In all cases in which the inoculation succeeded the Wassermann reaction was positive. As a control Stanziale inoculated lepra nodules into the abdomen of another rabbit, and found at intervals after a month the reaction constantly negative. The same negative result was achieved after grafting into the cornea of rabbits pieces of human skin or dead leprous nodules.

These experiments of Stanziale have been most carefully carried out, and full descriptive details are given.

1911.—Duval inoculated a series of animals—namely, four rats, four white mice, and four Japanese dancing mice—with grumous material taken from an acute case of human leprosy which had developed numerous soft subcutaneous leprous masses and had repeated attacks of leprous fever. A small quantity of material was used in each case, namely, 0.5 c.cm. emulsified in 1 c.cm. of normal saline solution. Some were injected intraperitoneally, others subcutaneously.

The two white mice which received intraperitoneal injections died fourteen days after the inoculation. At the autopsy both showed a general infection of the peritoneum with a pure growth of the *B. lepræ*, while the mesentery, omentum, visceral and parietal peritoneum contained numerous minute, firm greyish-white nodules, which on microscopic section proved to be typical leprous lesions. The most surprising feature was the occurrence of a slightly turbid, semigelatinous exudate, which microscopically consisted almost entirely of large mononucleated cells (macrophages). Great numbers of these cells were filled with acid-fast bacilli, and scarcely any were found that did not contain a few. No remarks are made about the other animals.

1911.—Couret fed two goldfish on teased nodules from a leper. No other food was allowed the animals until they had disposed of the leprosy tissue, after which they were cleansed and transferred to a clean aquarium.

The first was examined twenty-four days later; acid-fast organisms had not been found in the fæces for three days before the animal was killed. No evidence of infection was apparent externally or internally. Films made from the omentum and other organs showed a few scattered acid-fast bacilli. The average number of bacilli to the slide was about four, and no change in morphology was seen. The second fish was examined after thirty-seven days. The findings were similar to those in the first one.

Abstract.

FILARIASIS IN FIJI.*

By P. H. Bahr, M.A., M.B., B.C., D.T.M. & H.Camb.

Dr. Bahr, after some introductory remarks, said that his investigations on filariasis in Fiji were directed more especially to the Fijians, and confirmed many of the observations of previous workers. Dr. Bahr's conclusions, briefly stated, are as follows:—

I.—A large proportion of all Fijians (27.1 per cent.) harbour microfilariæ in their blood; this figure, however, probably does not represent the aggregate liability of these people to filarial infection. Adult filariæ were found in the lymphatics, especially the lymphatic glands, without the presence of the corresponding microfilariæ in the blood. Again, a large proportion of Fijians are affected with lesions commonly regarded as being of filarial origin, in whom no microfilariæ could be found in the blood; that is to say, the proportion of Fijians carrying microfilariæ (27.1 per cent.), added to the total affected by filarial disease, but without microfilariæ (25.4 per cent.), represented no less than 52.5 per cent. of the entire population. Moreover, all Fijians, as well as foreigners for some time resident in Fiji, exhibited a well-marked eosinophilia, and this even in the absence of evidence of infection with intestinal or other metazoal parasites. In addition to this, microfilariæ have been observed to disappear from the blood-stream of patients while under observation. So it is not unreasonable to conclude that nearly every Fijian has, at one time or another, been the subject of filarial invasion.

II.—(1) At the present state of knowledge it cannot be stated definitely whether the Fijian filaria is a new species or a local variety, or whether it is really *Filaria bancrofti* with the habit of its microfilariæ as regards periodicity modified by local circumstances. There are certain reasons in favour of its being a new species, and others, apparently equally good, against that supposition. In favour of its being a new species are the following:—

(*a*) The larval form (microfilaria) exhibits in the blood no periodicity, contrary to what happens in the case of *F. bancrofti;* it occurs in equal abundance in the blood at all hours of the day or night.

(*b*) While capable of development in *Culex fatigans*—the favourite intermediary host of *F. bancrofti*—this mosquito is not nearly so efficient an intermediary in Fiji as it is in other countries, or as is *Stegomyia pseudoscutellaris* (Theobald), the common mosquito of this group of islands.

(2) In favour of the Fijian filaria being identical with *F. bancrofti* were the following facts:—

(*a*) The Fijian microfilaria is morphologically identical with *Microfilaria bancrofti.*

(*b*) The parental form of this microfilaria is, as far as can be ascertained, identical with *F. bancrofti.*

(*c*) Both nematodes live in the same tissues, and are associated with the same diseases.

(*d*) The same mosquito, *S. pseudoscutellaris*, is an efficient intermediary for *F. bancrofti.*

III.—Assuming that the Fijian filaria is *F. bancrofti*, it may be that the absence of periodicity is a partial adaptation to the habits of its usual intermediary host in Fiji—*S. pseudoscutellaris*—a mosquito which feeds by day only. This absence of periodicity in the Fijian filaria does not depend on the habits or any racial peculiarity in the human host, for, if a native of India or the Solomon Islands comes to reside in Fiji, his microfilariæ retain their habit of nocturnal periodicity; but when a stranger acquires filarial infection in Fiji, the corresponding microfilariæ exhibit no such periodicity, but in this respect comport themselves in the same way as the microfilariæ of the native Fijian.

IV.—The principal expression of filarial infection in Fiji is the same as elsewhere, viz., elephantiasis.

V.—The lower extremities and scrotum are the parts of the body most frequently affected, but in comparison with the natives of China, India, and the West Indies, the natives of Fiji, and probably of other Pacific Islands, are peculiarly liable to elephantiasis of the upper extremities; on the other hand, chyluria, lymph scrotum, varicose groin glands, and other forms of lymphatic varix depending on filarial obstruction of the thoracic duct above the entrance of the chyle vessels are rare. In many cases adult filariæ occur in large numbers in the tissues, especially in the lymphatic glands and vessels, but also in other tissues, the epididymis, testis and tunica vaginalis. In the latter circumstance may lie a contributory cause to the well-known infecundity of the Fijian.

VI.—In the situations mentioned, the adult filariæ may die and become cretified.

VII.—The adult filaria is not infrequently the cause of abscess, of hydrocele, enlarged testis and of thickening of lymphatic vessels, and even of fugitive swellings resembling Calabar swellings; but whether alive or cretified they are the direct cause of fibrosis and blocking of lymphatic glands and channels. Calcified filariæ have been found in the interior of and blocking the vasa efferentia of the epididymis.

VIII.—The microfilariæ produced by the parent worm may not reach the general circulation, perishing in the gland or organ in which the worm is lying.

IX.—The occurrence of periodical attacks of lymphangitis, orchitis and funiculitis can best be explained by periodical discharges of microfilariæ from the parental uterus.

X.—After such inflammatory attacks, the parent worm may perish.

XI.—Lymph from such inflammatory foci may be sterile or may be the seat of bacterial invasion,

* From a paper read before the Society of Tropical Medicine and Hygiene, January 19, 1912.

but lymph abstracted from elephantoid tissue is usually sterile.

XII.—Though the precise mechanism of the production of elephantiasis has yet to be determined, that the filaria is a principal factor is hardly open to doubt.

XIII.—Surgical and medical treatment of filarial disease being unsatisfactory, mosquito destruction directed especially against the important intermediary host, *S. pseudoscutellaris*, is the only means likely to prove of service in mitigating this important form of helminthiasis in these islands.

As regards headings IX to XII, the sections dealing especially with the pathology of filariasis and the relation of the filaria to elephantiasis, Dr. Bahr said that the production of lymphangitis, adenitis and orchitis, so frequent an occurrence in filarial invasion, required explanation.

He had been extremely fortunate in possessing a Fijian cook, the subject of recurring attacks of adenitis and orchitis, accompanied by rigors and high fever. He had him under minute and constant observation over a period of ten months. In his case the number of microfilariæ in the blood-stream suffered no diminution after the febrile attacks. During each attack of orchitis a collection of fluid was noticed in the tunica vaginalis. On aspiration this fluid was found to consist of a thin purulent material containing numbers of microfilariæ, many of which were active, whilst others were dead and undergoing disintegration. After the cessation of the inflammation this exudate became absorbed. The fluid remained sterile on culture. It was probable that the sudden and periodic discharge of microfilariæ into the tunica vaginalis originated these periodic attacks of orchitis in much the same manner as the production of Calabar swellings in the analogous infection with *Filaria loa*, as had been suggested by Manson.

The presence of microfilariæ in the blood-stream, Dr. Bahr believed, was not essential to the production of lymphangitis. Cases were encountered in whom, while suffering from a typical lymphangitis, no microfilariæ could be found in the blood.

In the present state of our knowledge, it was not possible to ascertain the number of microfilariæ produced by one adult worm, and consequently we were unable to estimate the effect of the death of one or more adult parasites on the numbers of circulating microfilariæ. Should the production of lymphangitis be due to the sudden emission of embryos into the lymphatic system, then it would be reasonable to suppose that the death of the parent worm itself was also the direct result of such an inflammatory disturbance. The frequency with which dead and calcified filariæ were found in lymphatic glands and in the testis—organs so frequently the seat of such inflammatory disturbances—lent support to this supposition. In one instance, a dead and partially calcified female filaria was found in a brachial lymphatic six weeks after an attack of lymphangitis in that region.

There apparently existed in Fiji another febrile condition due to filarial infection. Such cases were seen amongst the Fijians in their native villages. This was the condition rightly designated as filarial fever. Microfilariæ, for the most part, were absent from the blood-stream. There were frequent rigors, the eyes were bloodshot, and there was a marked leucocytosis. After forty-eight hours all symptoms had disappeared. It was possible that the condition might be due to an internal lymphangitis. Dr. Bahr obtained a *post mortem* on one case directly after such an attack. A great number of calcified filariæ were present in the glands. In the epididymis a recently dead and disintegrating filaria, surrounded by a purulent exudate, was found. All the lymphatic glands were enlarged, and contained large areas of stagnated lymph and giant cell formation. Many microfilariæ in a disintegrating condition were found in exudate from the lymphatics of the epididymis, but none in the blood.

Lymph obtained by gland puncture in cases of lymphangitis always proved sterile, whether inoculated on to agar, blood agar, or hydrocele fluid. The supervention of an infection by septic microorganisms was noted in two cases, one of which died from septic absorption consequent on the formation of a psoas abscess, which, tracking into the hip-joint, destroyed the acetabular cavity. The case commenced as an orchitis and adenitis. Microfilariæ were numerous in the blood, but disappeared suddenly, and streptococci could be cultivated from the gland exudate. In the second case the glands, which had been inflamed for a long period, were excised. A dead filaria was found coiled up in the centre of the gland, and a staphylococcus was cultivated from the purulent exudate. Microscopical sections showed giant cell formation. Cases of a similar nature had been recorded by Wise in British Guiana. It was probable that general septic infection supervening on filarial lesions was of general occurrence, and that the replacement of the glandular elements by fibrous tissue necessarily created a *locus minoris resistantiæ*.

The lymph obtained by puncture from elephantoid tissue in cases of elephantiasis proved sterile on culture. Dr. Bahr had only one opportunity of examining the lymph during a febrile attack in a case of elephantiasis, and this, too, proved sterile. All observers were agreed that repeated attacks of lymphangitis preceded the production of elephantiasis. Cases had been recorded by Low, however, in which elephantiasis had supervened without any febrile disturbance. A similar case was met with in a white trader in Fiji who gave an intelligent and accurate history of his disease.

The sterility of the lymph in cases of lymphangitis, observed by Dr. Bahr in Fiji, was in contradiction to the experiences of Le Dantec and Dubruel, who had found staphylococci and streptococci in this fluid. The microbic origin of tropical lymphangitis received support also from the researches of Sabouraud on elephantiasis nostras,

which apparently was due to a primary streptococcal infection of the lymphatics.

It was not necessary to assume a microbic infection for the production of elephantiasis. Dr. Bahr had satisfied himself that the blockage of the lymphatic glands and lymphatics took place by the filaria itself, and by the laying down of fibrous tissue in response to the presence of the parasite. He considered that lymph stasis might be produced in the following ways.

A.—*Blockage of lymphatic vessels.*

(1) Mechanical obstruction by the body of the living filaria and by its calcified remains.

(2) Changes in the vessel wall, by fibrosis and by proliferation of the endothelium, eventually leading to organization of the thrombosed contents.

B.—*Blockage of the lymphatic glands.*

Extensive fibrosis of the gland substance or by blockage of the efferent and afferent lymphatic trunks.

It was his belief that the production of tropical elephantiasis could best be explained by the blockage of lymphatic glands and channels by frequent and long continued invasion by filarial parasites.

Drugs and Appliances.

Apollinaris.—Apollinaris water has now been in use on board all the North German Lloyd steamers for close on thirty years. Last year the consumption reached the large figure of 200,000 bottles. As the water is a wholesome and refreshing one, this is not to be wondered at.

Report.

THE SOCIETY OF TROPICAL MEDICINE AND HYGIENE.

At a meeting of the Society of Tropical Medicine and Hygiene, held at 11, Chandos Street, Cavendish Square, London, W., on Friday, February 16, 1912, at 8.30 p.m., the following papers were read:—

(1) "A Review of Previous Results Obtained in the Experimental Cultivation of the Leprosy Bacillus, and a Demonstration of a New Method," by Dr. H. Bayon, The Lister Institute of Preventive Medicine.

(2) "The Treatment of Leprosy," by Professor Deycke, Hamburg.

(3) "The Experimental Production of Leprous Alterations in Animals," by Dr. Much, Chief of the Section for Experimental Therapy, Hamburg (Eppendorf).

(4) "Recent Advances in our Knowledge of Leprosy," by Dr. E. Marchoux.

(5) "Early Attempts at the Cultivation of the Leprosy Bacillus," by Dr. Phineas S. Abraham, London.

At the same meeting the following candidates were elected Fellows of the Society: Donald W. Carr, M.B., Persia; James G. Gibb, M.D., Pekin; George B. McHutchison, M.D., Kuala Lipis; Harold Parsons, M.B., Lewes.

Notes and News.

Dr. Bahr's reports on Filariasis and Dysentery in Fiji have now been published in monograph form,* and are worthy of careful study. The first is entitled "Filariasis and Elephantiasis in Fiji," and is the result of a year's study of these diseases in those islands. Amongst many interesting points brought out are the *rôle* of the filaria in the production of elephantiasis, and the mode by which this peculiar pathological state is produced. New evidence is adduced in favour of this view. The question of the influence of the mosquito intermediary on the habits of the parasite it transmits is also carefully dealt with, and means of prophylaxis are indicated. The monograph is well got up (Imperial 8vo.), is illustrated with coloured plates, has numerous full-page and other illustrations in black and white, and also has many charts and a map.

The second, entitled "Dysentery in Fiji," will be ready in March. It is a monograph on bacillary dysentery as occurring in Fiji. House-flies are shown to be the main carriers of this disease in Fiji, and in the passage through the intestinal canal of the fly variations, which so far have confused bacteriologists, are found to occur. Good results have been obtained as regards treatment by the administration of antiserum.

Personal Notes.

India Office.

From January 13 to February 17.

Arrivals Reported in London.—Major R. P. Wilson, I.M.S., B.; Captain G. J. Davys, I.M.S.; Captain F. C. Rogers, I.M.S.; Captain R. C. MacWatters, I.M.S.; Captain R. B. Nicholson, I.M.S.; Major J. W. D. Megaw, I.M.S., B.; Captain F. C. Rogers, I.M.S., M.; Lieutenant A. MacD. Dick, I.M.S.; Major C. Hudson, D S.O., I.M.S.; Lieutenant-Colonel C. J. Sarkies, I.M.S.

Extensions of Leave.—Major A. Moorhead, I.M.S., 14 days; Captain H. W. Illius, I.M.S., B., 5 days; Captain J. P. Cameron, I.M.S., M., 1 day; Lieutenant-Colonel C. E. L. Gilbert, I.M.S., 6 m., M.C.; Major J. W. F. Rait, I.M.S., B., 7 days; Major L. P. Stephen, I.M.S., Bo., 19 days.

Permitted to Return.—Captain H. W. Illius, I.M.S., B.

List of Indian Civil Officers on Leave (including Military Officers under Civil Rules).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Cochrane, Major A. W. R., I.M.S., U.P., 6 m., November 17, 1911.

Cornwall, Major J. W., I.M.S., M., 24 m., September 10, 1911.

Dyson, Lieutenant-Colonel T. E., I.M.S., Sanitary Comm., Bo., 12 m., Nov. 23, 1911.

* Witherby and Co., Publishers, 326, High Holborn, London.

Evans, Major S., I.M.S., Bo., 13 m., October 12, 1911.
Gillitt, Captain W., I.M.S., Bl. Goals, 10 m., October 16, 1911.
Goldsmith, H. M. Captain J. F., I.S.M.D., Burma, 12 m., May 15, 1911.
Good, Captain J., I.M.S., Burma, 24 m., April 19, 1911.
Gourlay, Captain C. A., I.M.S., E.B. & A., 18 m., April 7, 1911.
Greig, Captain A. W., I.M.S., Burma Gaols, 24 m., May 3, 1910.
Kenrick, Major W. H., I.M.S., C.P., 12 m., November 19, 1911.
Lloyd, Captain R. E., I.M.S., B., 24 m., November 16, 1911.
Oldham, Lieutenant-Colonel B. C., I.M.S., B., 15 m., August 11, 1911.
Wilson, Major R. P., I.M.S., B., 15 m., November 11, 1911.

LIST OF INDIAN MILITARY OFFICERS ON LEAVE.

Showing the Name, Regiment, or Department, and the Period for which the Leave was granted.

Davys, Captain G. I., I.M.S.
Dick, Lieutenant A. McD., I.M.S.
Lyons, Colonel R. W. S., I.M.S., to May 16, 1912.
MacWatters, Captain R. C., I.M.S.
Nicholson, Captain R. B., I.M.S.
Norman, Lieutenant V. P., I.M.S., 6 m., from November 15, 1911.
Rogers, F. C., I.M.S.
Stanley, Captain E. H. B., I.M.S., 1 y., from November 15, 1911.
Strickland, Lieutenant-Colonel P. C. H., I.M.S., 1 y., from October 7, 1911.
Thompson, Captain F. T., I.M.S.

COLONIAL MEDICAL SERVICES.

West African Medical Staff.

We regret to announce the deaths of J. F. W. Ward, L.R.C.S., L.R.C.P.Edin., L.F.P.S.Glas., Medical Officer, Sierra Leone, and D. W. Purkis, L.R.C.S., L.R.C.P.Edin., L.F.P.S.Glas., Medical Officer, Gold Coast.

No Resignations.

New Appointments.—The following gentlemen have been selected for appointment to the Staff:—B. A. Percival, M.A., M.B., B.C.Cantab., M.R.C.S.Eng., L.R.C.P.Lond., Northern Nigeria; E. J. J. Quirk, M.R.C.S.Eng., L.R.C.P.Lond., Southern Nigeria; J. W. Thomson, M.B., Ch.B.Glas., Northern Nigeria; R. Willan, M.R.C.S.Eng., L.R.C.P.Lond., Northern Nigeria; E. J. Powell, M.B., B.Ch., B.A.O.Dublin, Sierra Leone.

Other Colonies.

D. C. Robertson, M.B., Ch.B.Aberdeen, has been selected for appointment as a Medical Officer (Grade III.) in the Federated Malay States.

Dr. A. Montague has been appointed Senior Medical Officer, Resident Medical Superintendent, Colonial Hospital, Medical Officer, Suva Gaol, and Medical Superintendent of the Public Lunatic Asylum, Fiji.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

British Medical Journal, February 24, 1912.

Leprosy in Animals.—Bayon writes in the above number of the *British Medical Journal* on the transmission of leprosy to animals by direct inoculation. The conclusions arrived at are as follows: (1) Leprosy can under certain circumstances be transmitted to animals, the main difficulties being the high percentage of unsuccesses and the long incubation. (2) The most suitable animals appear to be the rabbit, rat, or mouse. In the rabbit the intraocular method is preferable. The resulting lesions are often not visible to the naked eye, and are similar to those caused by certain strains of human tubercle. (3) In the rat the incubation is also very long, the resulting lesions being comparable to those occurring in spontaneous leprosy of the rat. (4) Not all leprous patients' nodoles are equally "infective" for animals. In some cases the lepra "bacilli" appear to be absolutely incapable of multiplication, for reasons we do not at present know.

According to Stanziale's experiments, the "Wassermann reaction" is positive in rabbits which have been successfully inoculated.

"Boston Medical and Surgical Journal," February 1, 1912.

Intestinal Myiasis.—Hart reports another case of intestinal myiasis. The patient, a woman, complained of some vague pains in the abdomen, and also had some pruritus ani. She passed from time to time what she believed to be worms, but these on being investigated turned out to be maggots. Dr. Barker, of Boston, who reported on them, stated that they were the larvæ of *Homalomyia canicularis*, one of the house-flies. Thymol and other remedies were tried in the treatment.

"Medical Record," February 3, 1912.

Yellow Fever.—The *Medical Record*, in its news for the week, reports that Dr. Parker of the United States Marine-Hospital Service, stationed at Guayaquil, states that he has ten more of the crew of the gunboat *Yorktown* under his care in Guayaquil. Seven of these have yellow fever and three others are suspected of having the disease. Two deaths have occurred.

"Lancet," February 10, 1912.

Tubercular Myocarditis.—Bahr and Low report a very interesting case of tuberculosis, with special involvement of the heart. The patient was a Fijian female about 25 years of age. At the autopsy an extraordinary condition of the wall of the heart was found, most of the muscular tissue being replaced by caseous tubercular masses, many of these being the size of ordinary marbles. Tubercle bacilli were found in large numbers, both in the heart lesions and in the other lesions in the lungs and elsewhere. Such involvement of the heart in tuberculosis is, of course, very rare

"Sleeping Sickness Bulletin," No. 34, 1912, vol. iv.

Sleeping Sickness.—The above number of the bulletin on sleeping sickness contains the following matter:—(1) The Human Trypanosome of Rhodesia; (2) Immunization Experiments; (3) Treatment; (4) Action of Serums and Liver Extracts on Trypanosomes; (5) The Serums of Primates and Trypanosome Infections; (6) Gambia Horse Trypanosomes; (7) Bionomics of Tsetse-flies; (8) Cryptic Trypanosomiasis, and other Papers; (9) Sleeping Sickness News—Gold Coast; French Congo (with map) and "New Cameroons"; Belgian Congo; (10) Monthly List of References.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

BLACKWATER FEVER IN BURMA.

By LAWRENCE G. FINK, M.B., C.M.Edin.

Fellow of the Society of Tropical Medicine and Hygiene (London); Civil Surgeon, Myaungmya, Burma.

ABSTRACT.

(1) *Introduction.*—Burma now included in the geographical distribution of blackwater fever—Necessity for ascertaining the distribution of malaria accurately and definitely in each province in India—Returns of vital statistics not reliable—Lines on which investigators should work in mapping out the really malarious tracts and districts—The relationship between malaria and blackwater fever.

(2) *Distribution in Burma.*—Blackwater fever has occurred in four districts in Upper Burma between 23° and 26°30′ North latitude—Assam, the Duars, and the Southern States of China lie within the same parallels—History of the disease in India and China—Number of known cases in Burma.

(3) *Some Etiological Considerations.*—Dr. Mitchell Bruce's three factors in the causation of acute infectious diseases—The practitioner's share in working out the etiology of such diseases—Young adult Europeans and Indians, recently arrived, have chiefly been affected—Malaria the essential cause of blackwater fever—Topography of the blackwater fever districts in Burma—Three varieties of anophelines—Malignant types of fever met with—The second etiological factor has to do with the patient's resistance—Disease known to native Kachins as "Ngak"—The "human factor" and the "exaltation of malaria" by the influx of susceptible population, Europeans, Indians, Chinese—The construction of Mu Valley Railway, the Gold Dredging Co., Forest Department and Ruby Mines Co. led to increase of susceptible population; so also did the Military Police battalions and British troops stationed on the frontier—The incidental or concomitant circumstances in the etiology of the disease referred to—Rainfall and Climate.

(4) *Prophylaxis*—Reduction of cases of malaria in the Myitkyina battalion as a result of quinine prophylaxis—Improvement of general health of sepoys—Five cases of blackwater fever amongst those receiving prophylactic doses of quinine.

(5) *Cases.*—Notes of six cases—The rôle of quinine in these cases discussed—The advantage of small daily doses of quinine as a prophylactic instead of large doses twice weekly. How long should quinine be taken to effect a "radical cure" of malaria? Hearsey's treatment successful in three cases—Quinine had no effect on post-hæmoglobinuric fever, and did not produce relapse of hæmoglobinuria.

LAURENCE G. FINK.

(1) INTRODUCTION.

IN the *Indian Medical Gazette*, September, 1907, pp. 328-31, attention was drawn by me to the fact that blackwater fever occurred in certain districts in Burma, and that in all these districts intense malaria was encountered. Since the publication of this article Burma has been included in the geographical distribution of the disease (*vide* Christophers' and Bentley's "Monograph on Blackwater Fever"). In Burma, as in other countries, certain districts are more malarious than others. At the Imperial Malaria Conference held at Simla in October, 1909, Major James, I.M.S., emphasized the necessity of ascertaining the distribution of malaria accurately and definitely in each province in India. He stated that until quite recently it was a common belief that Assam as a whole is intensely malarious, but the truth is that a great tract of the country is only very slightly malarious, and that in some areas the disease does not occur. He added that he believes that the same may be true even of a country with so bad a reputation for malaria as Burma. There is reason to believe that there are grounds for this bad reputation in certain districts of Burma, and the truth will be revealed by the detailed investigations which have now been started by and entrusted to selected malaria experts. The sweeping remarks made at Simla by Mr. Cholmely (the civilian member from Burma) that malaria was not so bad in Burma as to need any particular measures was unfortunate. He based his conclusion on the low fever death-rate—viz., 10 per mille in Lower Burma and 8 per mille in Upper Burma, compared with 19 for India. The registration of vital statistics in Burma is admitted to be far from reliable, and the causes of death, registered by ignorant village headmen, are very misleading. As a matter of fact, in some of the very malarious districts of Upper Burma (Myitkyina district, for example) no vital statistics are collected. The lines on which investigators in each province should work for the purpose of mapping out the really malarious tracts and districts have been detailed very carefully by Captain Christophers, I.M.S., and the progress of the work has been published, and will continue to be published, in *Paludism* (the Transactions of the Committee for the Study of Malaria in India). The memorandum of questions to which answers are desired by the Central Committee gives an idea as to the scope of the work which is being undertaken. The last question (*Paludism*, No. 1, p. 12) is, "In what parts, if any, of the province does blackwater fever occur?" This question appears to suggest that the Committee recognize some connection between blackwater fever and malaria. According to Deaderick, etiologically hæmoglobinuric fever stands in the same relation to malaria as do tabes and dementia paralytica, and may very properly be regarded as a "paramalarial" infection. At the Bombay Medical Congress, 1909, Christophers and Bentley stated that the malarial origin of blackwater fever is very generally admitted, but there is still a considerable amount of misconception regarding the relationship between malaria and this disease. They indicate how blackwater fever may be malarial in origin and yet not be malaria. Deaderick says the fact that hæmoglobinuric fever does not respond to quinine is one of the strongest evidences that it is not an attack of malaria *per se* (*vide* Cases 2 and 3).

(2) Distribution in Burma.

So far as I am aware, cases of blackwater fever have occurred in the Myitkyina, Katha, Bhamo and Ruby Mines districts. One case was also reported to me as having occurred at Taungdwingyi, in the Magwo district, and one at Pyawbwe, Yomothin district, after his return from Myitkyina, where he had had repeated attacks of malarial fever. At all these places pernicious types of malaria have been encountered. A glance at the map of Burma will show that the four districts first mentioned are grouped together between 23° and 26° 30' North latitude, practically between the same parallels of latitude as Assam and the Duars, where blackwater fever is known to occur. Eastward between the same parallels are the Southern States of China—viz., Yunnan, Kwangsi, and Kwantung; also the island of Formosa. Jefferys and Maxwell, in their recent book on "Diseases of China," state that it is doubtful if true blackwater fever exists in China, but two very suggestive cases have been reported by Maxwell (Fukien), and McCandliss (Hoihow). They, however, add that Wenyon (Fatshan), says: "It ravaged like a plague the Chinese army on the Tonquin border of Kwangsi." (This, according to Deaderick, occurred in 1885). The authors of "Diseases of China" also say that blackwater fever is said to be found in Formosa, but they have never themselves seen a case, and, despite diligent inquiries, have failed even to hear of one. They also state that the disease has only appeared to any extent in India during the last quarter of a century (according to Deaderick, only since 1855), that it has recently made its appearance in the New Hebrides, and that it is quite possible that it may yet do the same in China.

These facts have an important bearing on the history of the disease in Burma. From the literature at my disposal I am unable to find any recorded case earlier than the one reported by me in the *Indian Medical Gazette*, September, 1907. This case occurred at Myitkyina in July, 1899. The patient was a Gurkha military police sepoy, aged 22. From the scanty information received by me, I am aware of no less than fourteen cases of blackwater fever in Upper Burma, including the first case published by me. Out of those fourteen cases, seven were Europeans, with four deaths; five were Gurkhas, with two deaths, two recoveries, and one result unknown; two were Punjabis, with one death and one recovery. The cases amongst the Gurkhas all occurred in the Myitkyina district, and three were under my personal observation and treatment. I have no doubt that other cases have occurred of which I have no information. The case of a civil servant from Burma was published by Dr. J. E. Frere in the *Lancet*, June 18, 1910, pp. 1716-17. Dr. Frere's strictures on the alleged diagnosis of this case in Burma and on the irregular doses of quinine given for malaria prophylaxis in this province were commented on by me in the *Lancet* of September 10, 1910, pp. 847-8.

(3) Some Etiological Considerations.

Dr. Mitchell Bruce, in his address in medicine delivered at the Seventy-eighth Annual Meeting of the British Medical Association (*British Medical Journal*, July 30, 1910, pp. 246-51), says there are three factors to be reckoned with in the causation of acute infective diseases. First, there is the cause which we call essential, the specific infection, an extrinsic influence, the element without which in the particular instance, and in every other instance, the disease would not have occurred. Secondly, there is the patient's resistance to the specific infection, an intrinsic element. Thirdly, there may be incidental or concomitant circumstances or associations which are not essential, because not present in every instance of the disease, but which, by occurring incidentally in particular instances, either favour the essential influence directly in its invasion of the body, or, on the other hand, lower resistance, and thus directly contribute to the production of the disease.

In discussing these concomitant circumstances, he says they are of great variety, both in kind and of the manner of their incidence on the body. When they act immediately, they are commonly known as the exciting, precipitating, determining "causes" of disease, but in a large number of instances the connection is remote. Is it possible, he says, to trace common diseases to the common influences around us with scentific correctness? It is most difficult to say how far each of these influences acts directly, how far indirectly or incidentally only—that is, by interfering with resistance on the one hand, or by assisting essential causes on the other hand. The problem of the causation of many of the common diseases, when it comes to be faced practically, proves to be one of extreme complexity. It is rendered still more complex and difficult by the fact that the same influence may in one instance be an essential cause, in another instance an incidental circumstance only. Taken together, the three factors concerned in the production of disease constitute nothing less than the total relations of the individual and of the community to their environment. In devoting attention to these elements of causation; the practitioner contributes his share of the materials of which the doctrine of etiology is being constructed. Not all of us, indeed, but few of us, can work at the higher pathogeny. These words from the pen of so eminent an authority should encourage practitioners who may not be experts in pathology to take part in working out the etiology of this most interesting disease, or, as Deaderick speaks of it, "that mystic paramalarial syndrome, hæmoglobinuric fever." In considering the factors in the causation of blackwater fever in Burma, *malaria* may be regarded as the essential cause. At the Imperial Malaria Conference, Major Kenrick, I.M.S., stated that in the Central Provinces of India it was noteworthy that malignant tertian forms are more often met with in association with forests and low-lying land near jungle hills. Major Leonard Rogers also pointed out that Bengal villages surrounded by dense jungle had a higher spleen rate than those with little or moderate amount of jungle. In Madras, from the investigations of the Royal Society's Malaria Commission, the most malarious portions were at the

foot of the hills. In the four Upper Burma districts, where blackwater fever has been noted, the country consists of a series of high ranges of hills, and is intersected here and there by valleys, all leading towards the river Irrawaddy, or its principal tributary, the Chindwin. The hills, which range from 1,000 to 10,000 feet above sea-level, are covered, except where they have been cleared for cultivation, with dense forest with a tangled undergrowth of cane and small bush. There are also tracts of low-lying flat land, more or less water-logged during the rains, and used to some extent for paddy cultivation. Mr. H. N. Thompson, late Deputy Conservator of Forests, Burma, in describing the low-lying alluvial evergreen and swamp forests of the Hukawng valley, says the two factors that determine the distribution of this type of forests are a heavy rainfall and a rich alluvial soil, very often with a substratum of clay, the latter, when close to the surface, giving rise to the modification known as swamp forest; but this modification is also brought about by the flooding of the river banks for many months in the year, and the retention of the flood water in the low-lying depressions adjacent to the river beds. The country thus presents vast breeding places for mosquitoes. At Myitkyina the following anophelines were identified: (1) *M. Rossii;* (2) *N. fuliginosus;* (3) *N. Stephensii.* The latter two species are malaria carriers. Plehn suggested a possible relation between the geographical range of hæmoglobinuric fever and that of certain mosquitoes. According to Daniels, the carriers differ in the different countries, and in Africa *M. funesta* is the commonest carrier in places where blackwater fever is prevalent. As no careful malaria survey has yet been made, no definite statements can be made as regards the extent to which malaria prevails in Burma, and what is the usual percentage of infected anopheles or the proportional prevalence of the different varieties of malaria parasites in the areas where malignant types of the disease are met with. It has, however, been stated by Daniels that no morphological differences have been observed in the malaria parasites in a malarious country where blackwater fever is endemic, and in malarious countries where it does not occur. Deaderick says that while all localities in which Blackwater fever exists endemically are highly malarial, there are very extensive regions in which the severest forms of tropical malaria are rampant where hæmoglobinuric fever is unknown. Malignant types of fever occur not only in the Myitkyina and adjacent districts where blackwater fever occurs but also in other parts of Burma where this disease does not occur, so far as is at present known. The disease has not, however, been known to occur in any area free of malaria, and any such cases would be diagnosed as paroxysmal hæmoglobinuria, provided they had not been previously infected with malaria or come from an endemic blackwater fever area. Hence malaria may properly be regarded in any malarious area as the essential cause of blackwater fever, it being the element without which the disease would not occur. Deaderick's opinion of the relation of malaria to blackwater fever is that the former is essentially and solely the predisposing cause, and in some cases it may also act as the exciting cause. Christophers has shown why the malignant tertian parasite, with its special destructive action upon red cells and consequent stimulation to their phagocytosis, should above all be the one concerned in the causation of blackwater fever.

The second etiological factor has to do with the patient's resistance to the specific infection, and involves the consideration of race, sex, age, family predisposition, idiosyncrasy, previous attacks of hæmoglobinuria, length of residence in the endemic area, and occupation. These elements in the causation of the disease have been fully dealt with by Deaderick and others. As regards Burma the cases have been entirely, so far as I know, amongst Europeans and Indians, and these were chiefly young men recently arrived. The majority of the former have been engaged in forest service, exposed to severe malarial infection, and physically run down by long marches in the hot sun or exposed to wet and damp. At Myitkyina the sepoys were heavily infected by malaria, and this disease accounted for about 80 per cent. of the admissions to hospital before quinine prophylaxis was systematically enforced. During three years' residence at Myitkyina I never saw a single case of blackwater fever in a native Kachin, but I have reason to believe that the disease is known amongst them as "ngak." From reliable information received by me the disease is known to the Kachins in all parts of the Myitkyina district, and those who have been afflicted with the disease have always, previous to an attack, had a severe attack of malarial fever, and they say the fever passes away and is followed by "ngak." The disease is regarded as very deadly but is not very common. Some years it is said to be more prevalent than in other years, several cases occurring in one year and then no cases perhaps for a considerable time. Quinine is not known to these people in their native hills, and so takes no part in the causation of the disease. No female of any race has been known to have suffered from the disease in Burma. The number of European, Ghurka and Indian females is small in proportion to the number of males. Children also have been free from the disease. The cases that came under my personal treatment were first attacks, and, so far as I know, such was the case with all the others treated by other medical men, except the case at Taungdwingyi, who had two attacks, and in the second was treated by Dr. Wells, Civil Surgeon, Magwe. Christophers and Bentley have laid great stress on the "human factor" in the permanent exaltation of malaria characteristic of certain areas. The tropical aggregation of labour camps and the attendant hardships appear to them to afford the explanation of the special and peculiar unhealthiness of the Duars. They say: "It is this combination of factors and series of vicious cycles that is, we believe, responsible for the intensity attained by malaria, wherever the undertaking of large projects in a malarious country involves the employment of

numerous labourers and the establishment of labour camps." The construction of the Mu Valley Railway, from Sagaing to Myitkyina with a branch line to Katha, was commenced toward the end of 1889 and was completed in January, 1898. The entire line is 347 miles in length. A large number of Indian coolies were employed. In the Myitkyina and Katha districts the railway line passes through low-lying swampy areas, skirted by hills densely covered by virgin forests. Burman villages were few and far between. The opening of the railway has resulted in an increase of the population in this area, and in the headquarter towns and larger villages. Indians have settled in these places as shopkeepers, petty traders and railway employees. According to Daniels, imported Indians are about one-fourth as susceptible as Europeans. In the Myitkyina and Bhamo districts, which are both on the frontier of China, there is from time to time an influx of Chinese, who are said to be almost as susceptible as Whites. Manson says that many of the Chinese labourers on the Congo railway died of hæmoglobinuric fever. In the Myitkyina district a large battalion of military police, consisting of some 1,400 Gurkhas, is maintained. The Myitkyina Gold Dredging Co. was started about 1900, and about thirty Europeans are employed and some Indians. One European died of this disease about eighteen months ago. It will thus be seen that there has been within the past thirteen years in this district a great influx of people susceptible to malaria and unprotected by immunity. This human factor has probably resulted in an "exaltation of malaria," similar to what has taken place in the Duars, Assam, and elsewhere in India. This factor also, no doubt, accounts for the incidence or increased prevalence of blackwater fever in the district. Deaderick says the accession of Europeans was influential in the history of hæmoglobinuric fever in several ways—by the increase of susceptible population, by the importation of quinine, and by the advent of physicians competent to recognize and to describe the disease. The first case recognized by me occurred at Myitkyina in 1899, the year after the railway line to Myitkyina was completed. Mention must also be made of the valuable teak forests in the Myitkyina, Bhamo and Katha districts. These forests are worked under the supervision of Europeans in the service of certain companies. These men are much exposed to infection, and some of them have suffered from blackwater fever. In the Ruby Mines district the Ruby Mines Company began work in 1889, and several Europeans were employed. In addition to the usual Government officials there are a large number of military police sepoys in all these districts, and a European regiment at Bhamo. In considering the history of blackwater fever in Burma, this "human factor" has to be considered and given due weight.

The incidental or concomitant circumstances that may precipitate an attack of the disease are chiefly exposure to cold and damp, and probably fatigue. Other occasional causes need not be referred to here. The use of quinine must, however, be mentioned. The rainfall may roughly be said to be about 90 in. The temperature varies according to the elevation. In the winter months there is a decided fall in the temperature, and even on the plains Europeans require the comforts of a fireplace and a couple of stout blankets. Warm clothing is essential.

(4) Prophylaxis.

If malaria is the essential cause of blackwater fever the prophylaxis of the former includes that of the latter disease. The bulk of the people in Burma have no knowledge of the value of quinine as a prophylactic agent. Even Europeans, the majority of whom have vague ideas on the subject, either take the drug spasmodically or not at all as a prophylactic. By such people, without medical advice, the drug is used in a haphazard way for the cure of an attack of malaria. Recently endeavours have been made to popularize the prophylactic use of the drug. The amount of sickness amongst military police sepoys in Upper Burma attracted attention, and in 1908 definite steps were taken to adopt systematic antimalarial measures. I was then Civil Surgeon at Myitkyina, and, in addition to insisting on the use of mosquito nets by all sepoys, each man was given, as far as practicable, 10 gr. of quinine sulphate in mixture on each of two successive days each week from May to December. The average total strength of the battalion at headquarters and at the various outposts was about 1,400 men. The admissions for malarial fever are shown below for four years; in the former two years no prophylactic quinine was given, and in the latter two years it was issued in the dose stated above:—

	Indoor	Outdoor	Total
1906 ...	1,602	3,372	4,974
1907 ...	1,695	2,714	4,409
1908 ...	328	200	528
1909 ...	340	107	447

There was not only a great reduction in the number of cases of malarial fever, but also an improvement in the general health of the men, a modification in the severity of the attacks when these occurred, and a reduction in the number of cases exhibiting signs of malignant malaria. In previous years it was a common experience amongst outdoor patients to be asked to treat men who complained of headache, lassitude, loss of appetite, muscular pain, &c., which made them feel disinclined for work or any physical exercises. In 1908 and 1909 there was a marked reduction in these cases, which, in my opinion, were due to malarial infection producing the feeling of *malaise* generally experienced by residents in malarious countries. There were, in other words, less men in the latter years who complained of feeling "off colour." In a big frontier battalion this improvement in the physical health of the men was a matter of considerable importance, but our feeling of satisfaction was marred by the unfortunate occurrence of four cases of blackwater fever within six months, the first case on July 29, 1908, and the fourth on January 30, 1909. Two cases recovered and two died. The question naturally arises as to what relationship, if any, quinine bore to the attacks. The history of each case would best

enable us to consider the *rôle* of quinine in hæmoglobinuric fever as it occurred in the Myitkyina battalion.

(5) Brief History of a Few Cases.

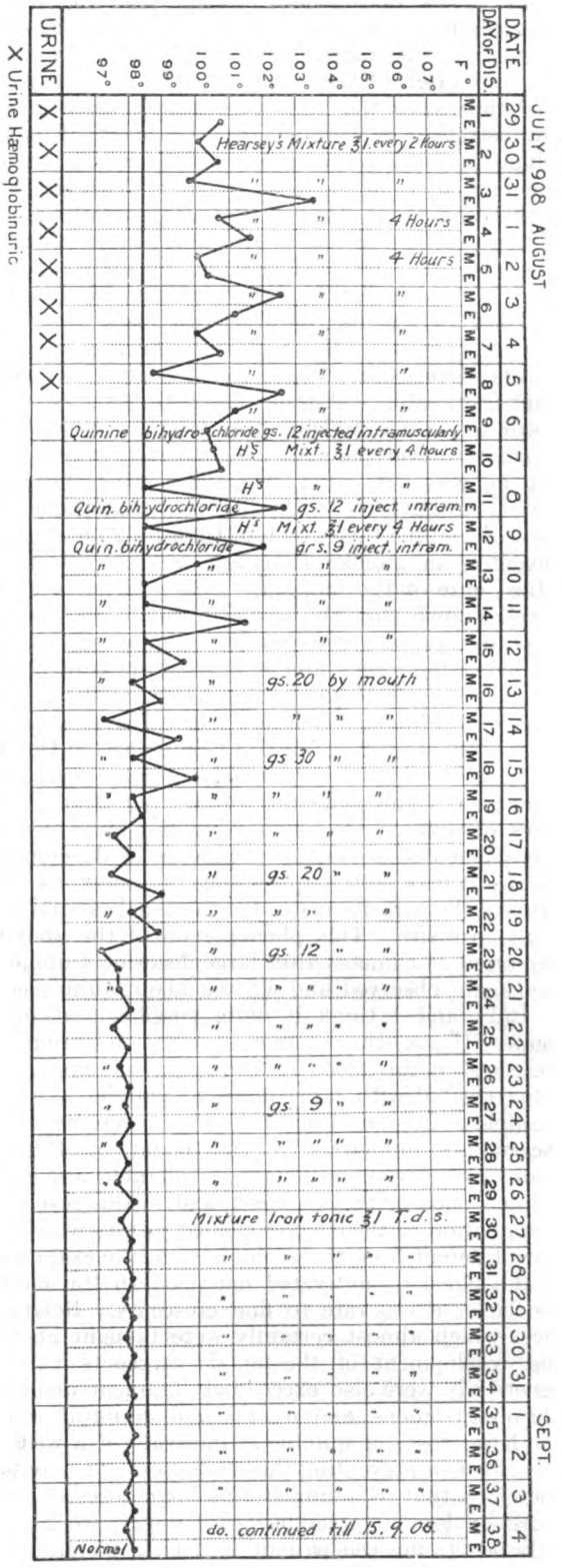
Case 1.—This case has already been published in the *Indian Medical Gazette*, September, 1907, and occurred in 1899 when prophylaxis was not adopted. The patient was a Ghurka military police sepoy, aged 22. I am now unable to state the length of his service in this district, but, judging from his age, he was probably a recent arrival. His full previous history as regards antecedent malarial attacks cannot also now be given. In May, 1899 he was admitted into hospital for malarial fever and was discharged after seven days. He was again admitted on July 3, suffering from malarial fever, and was discharged on July 13. On July 30, he again came to hospital complaining of great weakness, and also of pain in the epigastrium and loins. His eyes were somewhat yellow, liver and spleen were slightly enlarged. His temperature for the next three days was normal in the morning, but 102° and 104° F. respectively in the evening. He had been treated with the usual diaphoretics and quinine. On August 3, the urine was noticed to be hæmoglobinuric and was small in quantity. On August 8, the urine became almost entirely suppressed and the patient died on the 12th.

When this case occurred blackwater fever was not suspected and the patient was treated in the initial stage for malaria. It is not possible to say now whether the quinine given was the exciting cause of the hæmoglobinuria or not.

Case 2.—Ghurka sepoy, 3½ years' service, aged 20, admitted on July 29, 1908, suffering from blackwater fever. Previous history shows repeated short attacks of malarial fever in 1905, 1906, and 1907. Prophylactic doses (sulphate gr.x) were taken by him on the following dates in 1908:—

April 22, 23, 29, 30.
May 6, 7, 13, 14, 29, 21, 27, 28.
June 3, 4, 10, 11, 17, 18, 24, 25.
July 1, 2, 8, 9, 15, 16, 22, 23.

The patient was exposed to rain for about an hour on July 29, and got fever that same afternoon. It will be seen from the chart that the temperature was irregular, and lasted till the twenty-second day, when it became normal. The urine was hæmoglobinuric for the first eight days and then cleared up. The patient was forty-eight days in hospital and was discharged cured. No malaria parasites were found at any time in the blood. Hearsey's mixture (viz., sod. bicarb. gr.x, liq. hydrarg. perchlor. ♏xxx, aq. ad ʒi) was given every two hours for the first two days, and then every four hours up to the twelfth day. On the ninth day, when the urine had cleared, quinine hydrochloride gr. xii was injected intramuscularly, and the same dose repeated on the eleventh day. The subsequent treatment with quinine is shown on the chart. There was no relapse of hæmoglobinuria. There are many interesting



points in this case. The man had been very regular in taking his weekly prophylactic doses of quinine and remained free of malarial fever. His last dose of quinine was taken on July 23, and his attack of blackwater fever commenced on July 29. Deaderick says the time intervening between the administration of quinine and the onset of hæmoglobinuria is almost uniformly fixed by various observers, at from one to six hours. With six hours as the maximum interval, the cases really due to quinine would dwindle. In this case, therefore, quinine cannot be considered as the exciting cause. It is also somewhat hard to explain why this man, who had had regular prophylactic doses of quinine for over three months without suffering from any malarial fever, should have had his attack of blackwater fever after a short exposure to rain. It would be safe to assume, judging from the number of attacks of malarial fever the man had had in previous years, that he was not cured of malaria when he began quinine prophylaxis in April: also, that the weekly doses of quinine taken by him till July 23 had merely prevented an attack of malaria without effecting a radical cure of the malaria. Deaderick says that it is well known that the sexual forms of the malarial parasites are very resistant to quinine, persisting in the blood for weeks and months despite the liberal use of quinine. Major James, I.M.S., in his valuable paper on "Problems Relating to the Use of Quinine," read at the Imperial Malaria Conference in October, 1909, said: "It is now nearly twenty years since Marchiafava and Bignami pointed out that if large doses of quinine are given when the blood contains only pigmented parasites in process of development, the result may be the appearance of numerous sexual forms of the parasite instead of the usual asexual forms of the parasite. This phenomenon of the abundant formation of gametes after large doses of quinine has been again observed and written about quite recently in Italy, and I think it quite possible that in this country (India) the common observation of numerous crescents in the blood of European soldiers who are being treated with large doses of quinine is also an example of it. In Mian Mir last year, crescents were exceedingly numerous in the blood of European soldiers who were receiving considerable amounts of quinine once or twice a week, and in this respect the examination of their blood yielded results which were very different from those obtained in the examination of the blood of untreated natives. In the blood of the latter it was rare to find crescents. Relapses of fever which almost certainly were brought about by the development of the female crescents parthenogenetically were also exceedingly frequent among the European troops, and it appeared doubtful whether the large doses of quinine at intervals of a week had any effect in preventing these relapses. It is possible, therefore, that by administering large doses of quinine more or less in a haphazard manner, we may not only be placing the patient in such a condition that he is very liable to relapses, but may be increasing enormously the sources from which anopheles mosquitoes become infected. This possibility is worthy of serious consideration and investigation." Schaudinn has also recently mooted the idea of recrudescence in consequence of parthenogeny or gametoschizogeny of the sexual forms. Major Ronald Ross has also endeavoured, from an enumeration of the parasites in the blood, to ascertain the lowest number of asexual forms required to produce any fever. This he calls the "pyrogenic limit." In the case of the Ghurkha sepoy the number of the asexual parasites was probably kept down by the quinine below the "pyrogenic limit," so that no attack of malarial fever occurred. Tne sexual parasites, however, were probably increasing, and the sudden recrudescence, parthenogenetically or otherwise, resulted not in an attack of malaria, but in an attack of blackwater fever. This is the only explanation I can offer.

Another point requiring determination, says Ronald Ross, is whether the lethal action of quinine becomes more and more or less and less marked day after day, so as to enable us to say how long the treatment must be continued to obtain total extirpation of the parasites. Harriss, in writing on the "Radical Cure of Malaria" in the *Journal of the American Medical Association*, November 26, 1910, asks: "How long should the quinine be continued to attain a radical cure?" He quotes Ross: "To extirpate the parasite in a patient demands four months assiduous cinchonization," and Harriss believes that this is the safest rule to follow. James advocates a small dose every evening. Ross also favours the continuous method for long periods. In localities in which æstivo-autumnal malaria is prevalent Deaderick says the shorter interval of administration should be preferred on account of the shorter period of incubation of this form of malaria. The method adopted at Myitkyina, 10 gr. quinine on two successive days each week from May to December, gave good results as regards reduction in the number of malarial fever cases, but, as malignant types of malaria and blackwater fever occur in this district, it may be advisable to consider the advantages of giving small doses daily for four or five months with a view to eradicating the parasites, effecting a "radical cure" of malaria and preventing the occurrence of hæmoglobinuric fever.

It will be seen from the chart that the patient had post-hæmoglobinuric fever. This is not unusual, and is said to be related to post-malarial secondary fever, or sporogenous fever, occasionally observed after the infection, particularly æstivo-autumnal, has lasted for some time. Both forms persist for days or weeks uninfluenced by quinine, and the blood examination is negative for parasites. No satisfactory explanation has been given as to the cause of the fever, malarial or post-hæmoglobinuric. Ronald Ross, however, concludes that "in blackwater fever there must be some subterranean factor at work—some process different from the ordinary processes of ordinary malaria." (*Transactions of the Society of Tropical Malaria and Hygiene*, March, 1911, p. 145.)

As regards the treatment adopted, it will suffice to say that Hearsay's mixture acted satisfactorily, and when the urine cleared the administration of quinine appeared to do no harm.

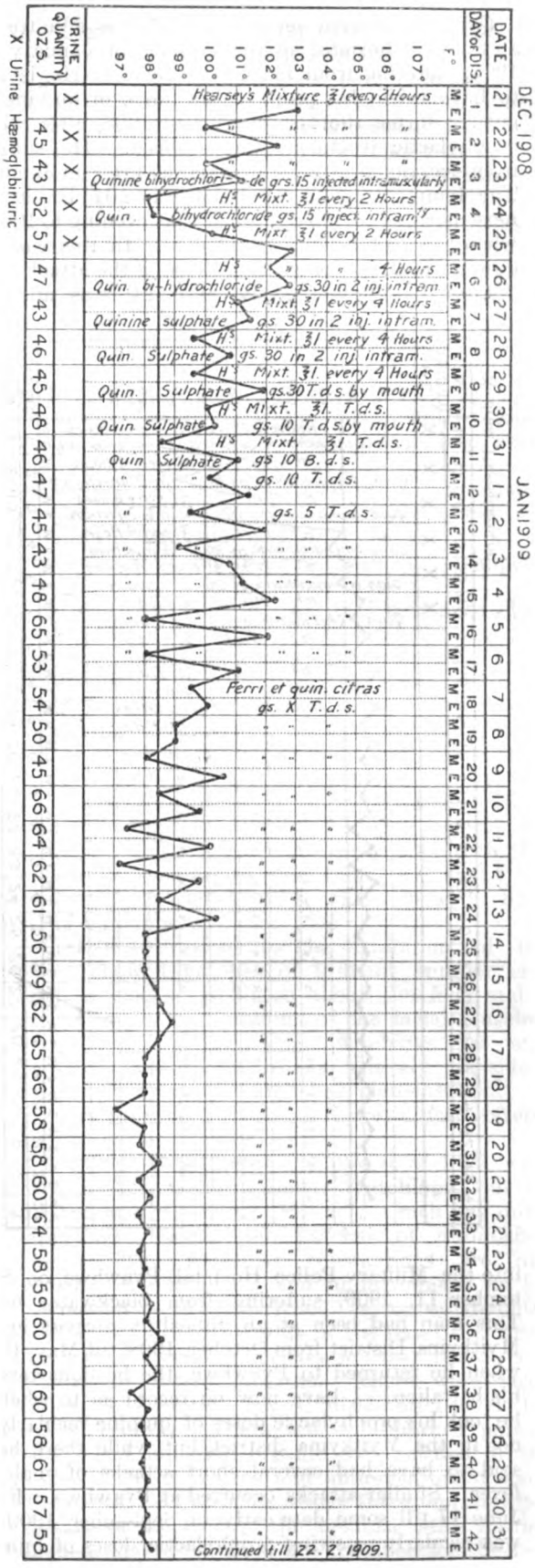
Case 3.—Ghurka recruit, one year's service, aged 22, was admitted to hospital at 11.30 a.m., on December 21, 1908, suffering from blackwater fever. In January, 1908, he was ten days in hospital for malarial fever. He received 10 gr. sulphate of quinine as a prophylactic on the dates mentioned below, and missed his dose on the dates *in italics* :—

April 22, 23, 29, *30*.
May 6, *7*, *13*, *14*, *20*, 21, 27, 28.
June 4, 5, 11, 12, 18, 19, 25, 26.
July 2, 3, 9. 10, 16, 17, 23, 24, 30, 31.
August 6, 7, 13, 14, 20, 21, 27, 28.
September 3, 4, 10, 11, 17, 18, 23, 24, 30.
October 1, 7, 8, 14, 15, 21, 22, *28*, *29*.
November 4, 5. 11, 12, 18, 19, *26*, *27*.
December *2*, *3*, *9*, *10*, 12, 13, 19, 20,

His last dose was taken in the forenoon of December 20, and that same evening he had severe rigors, fever, and high red-coloured urine. The patient had had a good deal of quinine, but none from November 20 till December 11. During this interval he may have been infected, but as the blood was not examined, the patient being well and on duty, it is not possible to say anything about the presence or otherwise of parasites. The quinine given on December 20 may have precipitated the attack of blackwater fever. Deaderick says that quinine is of value as a prophylactic in blackwater fever when systematically employed; if not thus used, and malarial infection be permitted to occur, it may, in some persons thus predisposed, act as the existing cause.

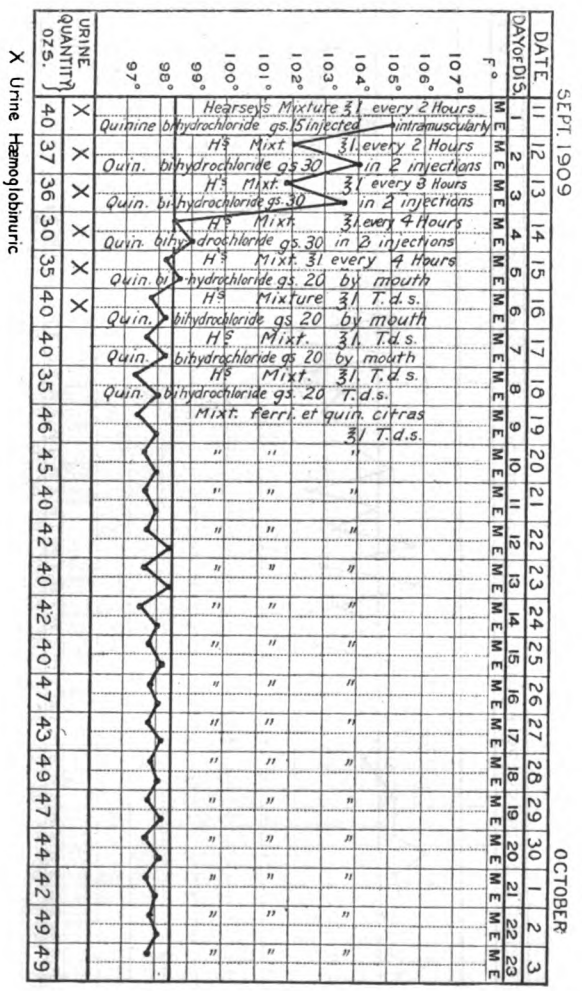
The hæmoglobinuria lasted five days, the post-hæmoglobinuric fever lasted till the twenty-fifth day. Hearsey's mixture and quinine were administered as shown on the chart, and the patient was discharged from hospital after a stay of sixty-three days. It will be seen that in spite of large doses of quinine sulphate by intramuscular injection and by the mouth there was no relapse of the hæmoglobinuria. Deaderick says the same individual may have an attack of hæmoglobinuria following the administration of quinine and later take it without harmful results; also the great majority of cases recover even under the continued use of large doses of quinine. The treatment adopted in this case must not be taken as a recommendation that quinine should be used in all cases.

Case 4.—Native of India (Punjabi), aged 28, was admitted into one of the outpost hospitals on December 1908, suffering from blackwater fever. He was an orderly to a military police officer and travelled about in the district a good deal, being much exposed to malarial infection and wet weather. He had neglected to take prophylactic doses of quinine regularly and had suffered from several recent attacks of malarial fever. In this case quinine had nothing to do with the onset of the blackwater fever. He took ill in the jungle and was sent into hospital for treatment. The patient's temperature fell from 102° F. on the evening of the second day to normal on the morning of the third day and continued normal till he died on the eighth day from suppression of the urine.


DEC. 1908
JAN. 1909
X Urine Hæmoglobinuric
Hearsey's Mixture ℥1 every 2 Hours
Quinine bihydrochloride gs. 15 injected intramuscularly
Quin. bihydrochloride gs. 15 inject. intram.
Quin. bi-hydrochloride gs. 30 in 2 inj. intram.
Quinine sulphate gs. 30 in 2 inj. intram.
Quin. Sulphate gs. 30 in 2 inj. intram.
Quin. Sulphate gs. 30 T. d. s. by mouth
Quin. Sulphate gs. 10 T. d. s. by mouth
Quin. Sulphate gs. 10 B. d. s.
gs. 10 T. d. s.
gs. 5 T. d. s.
Ferri et quin. citras gs. X T. d. s.
Continued till 22. 2. 1909.

Case 5.—Ghurka sepoy, aged 22, was admitted to an outpost hospital in the evening of January 30, 1909, suffering from blackwater fever. He is said to have taken his prophylactic doses of quinine regularly during the last quarter of 1908, after which prophylactic treatment was stopped. He suffered from occasional attacks of malarial fever in January. The temperature on admission was 104° F.; it rose next morning to 105·8° F., and that evening to 106° F. when the man collapsed and died. In this case the quinine was not the exciting cause of the attack.

Case 6.—Punjabi sepoy, aged 24, was admitted


X Urine Hæmoglobinuric
SEPT. 1909
OCTOBER
Hearsey's Mixture ℥1 every 2 Hours
Quinine bihydrochloride gs.15 injected intramuscularly
H^s Mixt. ℥1 every 2 Hours
Quin. bihydrochloride gs.30 in 2 injections
H^s Mixt. ℥1 every 3 Hours
Quin. bihydrochloride gs.30 in 2 injections
H^s Mixt. ℥1 every 4 Hours
Quin. bihydrochloride gs.30 in 3 injections
H^s Mixt. ℥1 every 4 Hours
Quin. bihydrochloride gs.20 by mouth
H^s Mixture ℥1 T.d.s.
Quin. bihydrochloride gs.20 by mouth
H^s Mixt. ℥1 T.d.s.
Quin. bihydrochloride gs.20 by mouth
H^s Mixt. ℥1 T.d.s.
Quin. bihydrochloride gs.20 T.d.s.
Mixt. ferri. et quin. citras ℥1 T.d.s.
DATE
DAY OF DIS.
URINE QUANTITY OZS.
F°

into the Military Police Hospital, Pyawbwe, on September 11, 1909, suffering from blackwater fever. This man had been at an unhealthy outpost in the Myitkyina District from October, 1908, till May, 1909, when he returned to Pyawbwe, the headquarters of his battalion. I have now no record as to whether he took his prophylactic doses of quinine regularly or not in the Myitkyina district, but while there he is said to have had several short attacks of malarial fever. Similar attacks occurred at Pyawbwe. From June 17 till some date early in September, 1909, he was regularly receiving prophylactic doses of quinine gr.x on each of two successive days each week. On the night previous to his attack he had a chill while on duty, and on the morning of September 11 he had rigors, high fever and hæmoglobinuria. The temperature came down to normal on the fourth day and the urine was clear on the seventh day. Hearsey's mixture and quinine were administered, *vide* chart. The patient was discharged well on the twenty-third day. In this case quinine had probably nothing to do with the onset of the attack.

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"SALVARSAN" AND LEPROSY.

By T. Lindsay Sandes, M.D.
Government Bacteriologist, Robben Island Leper Asylum.

The immediate and startling effect of the arsenical preparation, No. 606, *Dioxydiamidoarsenobenzenedihydrochloride*, on syphilitic lesions suggested its tentative application to leprosy. The beneficial action of "606" is not confined to the venereal disease alone; it seems as if many of the diseases due to spirillar or corkscrew shaped organisms are profoundly affected, aborted, or cured by this compound. Leprosy is, however, due to infection by an organism of a lower group, and there were therefore no *a priori* grounds for expecting successful results.

Thirteen typical and active cases representing both varieties of the disease were selected. Complete and accurate notes and charts of their condition were made. The nasal discharge was bacteriologically examined and found to contain *Bacillus lepræ* in all the tubercular forms. In the anæsthetic cases, where the nasal secretion showed no leprosy bacilli, they were demonstrated elsewhere; in one only of these anæsthetic cases I failed to establish a positive bacteriologic result.

One tubercular patient had a serious concomitant syphilitic lesion in the shape of a large perforation

of the soft palate—the luetic ulceration being at the time in a state of destructive activity.

From the date of commencement of the treatment the patients were seen daily as far as possible, and any observable alteration, improvement or retrogression was at once recorded.

With respect to the method of administration of the preparation employed, patients Nos. 1353 and 1224 each received one intramuscular injection; but as this method was accompanied by violent pain, was followed by local destruction of muscular substance, and seemed less likely to be as efficient as the intravenous mode, it was abandoned. All the other injections, forty-eight in number, were intravenous.

The solutions were prepared as follows:—

Into a sterilized flask 0.6 gramme of the salt were poured. To this was added about 100 c.c. hot physiologic saline solution and the flask shaken. The drug at once went into solution, forming a clear yellow liquid with a markedly acid reaction. By means of a pipette a 15 per cent. solution of KOH was instilled, drop by drop, until complete precipitation and re-solution into a clear liquid had taken place. More physiologic sterile saline solution was then added until the total contents registered 250 c.c.

This solution was at once injected by means of static pressure through a glass container, rubber tube and curved needle directly into one of the larger veins of the arm, or on one or two occasions into one of the dorsal veins of the foot. The apparatus was washed through into the vein at the conclusion with 20 or 30 c.c. of the saline solution. Strict asepsis was observed throughout.

The subjoined statement, marked A, shows at a glance all essential details of the injections.

The patients complained of no discomfort during the actual process. They left the operating room, walked unaided to their yards—being, however, under the supervision of a special attendant. Some of the less neurotic, after the injection, immediately resumed their interrupted employment, and seemed to suffer no inconvenience whatever.

Toxic effects appeared, as a rule, about one hour later. These consisted, in brief, of cerebral throbbing or headache, vomiting and intestinal peristalsis, leading to a few evacuations. Such sequelæ were not always present, but appeared in the majority of instances. The temperature during this immediate toxæmia rose to 99° or 100° F. At the end of twenty-four hours all ill-effects had passed off, nor did any subsequently develop. In fact, although two patients received each eight maximum doses with intervals of less, on an average, than twelve days between the injections, there were no undesirable complications such as optic atrophy, nor indeed any lesion attributable to the use of the preparation.

It will be observed from the tabular statement that no beneficial results were obtained in any of the pure tubercular cases treated. Three months (excepting in one case) have almost elapsed since the date of the last injection, and I believe I am justified in definitely stating that, so far as external appearances or physical examinations indicate, the disease is in no wise retarded or affected in any of these cases. Bacilli have been demonstrated in all of them on several occasions within the last month, but it is a fact of some importance that the bacilli were distinctly fewer and more difficult to find as a rule in smears made subsequently to treatment than in those previously obtained.

Professor P. G. Unna, of Hamburg, has evolved a means of differentiation of living and dead bacilli by double staining. I believe it would be nearer the mark in this to substitute the terms "younger" and "older" for "living" and "dead" bacilli. The application of this means of staining to the sections of tissues showed as great a proportion of degenerated bacilli in the sections taken prior to the injections as in those taken subsequently. Both types were constantly present, and indeed seem invariably to be in any positive slides made by me from leprous tissues in which I used this compound staining. As this method of staining is not generally known, and may perhaps be of value in estimating the action of drugs on bacilli, I append a brief note (marked B) in explanation.

The syphilitic ulcer in No. 1157 began to close after the first injection, had completely healed after the second, and has remained a sound scar.

With respect to the remaining cases, two are termed "mixed"; practically, however, they were well-marked anæsthetic cases showing early facial signs of a tubercular superimposition. The other two were pure cases of the anæsthetic variety.

No. 1353.—Seems to me to be no better. He is a man of education and intelligence, and he, together with the other officials associated with this investigation, maintains that there is a slight improvement. In deference to these views I have marked him thus.

No. 1308.—Previous to the exhibition of the "606" showed patches of brilliant annular erythema, a distinct puffiness about the face and a frequent fascicular twitching of the facial muscles. The swelling and occasional twitchings are still observable, but the rash has entirely subsided, leaving only areas of diminished pigmentation.

Smears from both these cases are, unfortunately, still positive.

No. 1365.—Was almost a duplicate of 1308, with a well-marked rash, muscular twitchings, but no tumefaction of the face. His active rash has quite disappeared, leaving the patches of diminished pigment. The muscular contractions are undoubtedly less frequent, and improvement, as far as appearances are concerned, is quite definite. Bacilli are still demonstrable in the nasal secretion.

No. 1235.—Is an old anæsthetic case. His disease was still in active progress. There were large patches, with active edges, distributed over his trunk and limbs. There was well-marked paresis of his facial muscles, organic contractures of the muscles of the forearms and abbreviation of some of the digits. At present, nearly three months after cessation of treatment, the maculæ still display reddened, active margins, but modified for the better. The other organic changes are unaffected.

STATEMENT A.—A TREATMENT OF CASES OF LEPROSY WITH "SALVARSAN."

Number of patients	Variety of disease	Dose of drug at each injection	Number of injections	Total quantity of drug injected	Intervals in days between each injection	Date of last injection	Presence of bacilli previous to treatment	Presence of bacilli subsequently	Result of treatment at time of writing, September 14, 1911
		Grm.		Grm.					
610	Tubercular	0.6	1	0.6	...	April 10	+	+	No improvement.
1021	,,	0.6	1	0.6	...	May 16	+	+	,,
1104	,,	0.6	2	1.2	72	September 7	+	+	,,
1308	Mixed	0.6	2	1.2	14	June 27	+	+	Considerable improvement.
1224	Tubercular	0.6	2	1.2	10	April 27	+	+	No improvement.
1353	Mixed	0.6	4	2.4	10-64-65	August 3	+	+	Slight improvement (?)
710	Tubercular	0.6	4	2.4	7-14-14	June 27	+	+	No improvement.
1130	,,	0.6	4	2.4	31-32-14	,,	+	+	,,
1047	,,	0.6	4	2.4	7-14-14	,,	+	+	,,
1365	Anæsthetic	0.6	5	3.0	7-7-14-14	,,	+	+	Considerable improvement.
1157	Tubercular	0.6	6	3.6	10-45-12-21-14	,,	+	+	No improvement.
1316	,,	0.6	8	4.8	17-18-13-12-7-14-14	,,	+	+	,,
1235	Anæsthetic	0.6	8	4.8	13-18-13-12-7-14-14	,,	−	−	Slight improvement (?)

NOTE B.—Method of double staining for the differentiation of younger leprosy bacilli from more senile or degenerated forms :—

I.—Fuchsin-Methylene Blue Method.

(1) Fixation of skin in HNO_3 (1 per cent.) 2 hours.
(2) Harden in abs. alcohol and embed in celloidin.
(3) Cut sections 10 to 15 μ.
(4) Carbol fuchsin on slide 1 hour.
(5) Wash water.
(6) HNO_3 (30 per cent.) a few seconds.
(7) Alcohol.
(8) Polychrome methylene blue solution ½ hour.
(9) Water.
(10) Orcein solution (1 per cent.) ½ hour.
(11) Alcohol.
(12) Water—dry on slide with filter paper.
(13) Aniline oil HNO_3 (1 per cent.) decolorize.
(14) Aniline oil, xylol, balsam.

II.—Victoria Blue-Safranine Method.

(1) Fix skin HNO_3 (1 per cent.) 2 hours.
(2) Harden alcohol abs. and embed celloidin.
(3) Cut sections 10 to 15 μ.
(4) Thymen-Victoria blue 12 hours.
(5) Water-wash.
(6) Alcohol till no stains come away.
(7) Water-wash.
(8) Thymen-safranine (½ per cent.).
(9) Water-wash.
(10) HNO_3 (30 per cent.) 2 seconds.
(11) Alcohol.
Bergamot oil, balsam.

Leprosy bacilli are not to be found in the nasal secretion nor elsewhere; however, as I could never find any in his case this fact does not help one much.

To sum up the results of these experiments: Tubercular leprosy does not seem to be benefited by the administration of the Ehrlich-Hata preparation. The cutaneous eruptions of the maculo-anæsthetic form of the disease do seem to be influenced, but whether this is merely a temporary improvement or an initial sign of a prolonged amelioration or cure I am not yet in a position to say. Histologic changes in this disease occur very slowly. It were premature then to give a final verdict on the effect of "606" on leprosy. Taking all factors into consideration, however, results at this date are not encouraging.

"British Medical Journal," January 6, 1912.

The Abor Arrow Poison.—Major Windsor, I.M.S., reports on the nature of the Abor arrow poison. The material he tested was scraped off an arrow-head removed from a wounded man. It was moist and earthy looking. An oleaginous resinous body was extracted which was soluble in alcohol (90 per cent.) and dilute acetic acid, also in ether and in chloroform, but insoluble in water. It gave the "croton oil reaction" on the tongue and in the pharynx. A little rubbed on the skin of the forearm raised a crop of minute papules in twenty hours. This patch was slightly reddened and itched; it was not painful, and only slightly tender on pressure; after ten hours more it had faded and slowly resolved. Inoculation of half the extract from this one arrow-head into a guinea-pig gave rise to no symptoms of poisoning. The insoluble residue was dry and powdery. It consisted of vegetable fibres, cells, and detritus, with some earthy matter, but no animal tissue; it gave no physiological reaction. A minute trace of an alkaloid-like body was obtained which had a slightly bitter taste, but no other characters by which it could be recognized. There was no aconite present in the poison. Major Windsor thinks that aconite is not used by the Abors, and that the idea that it is present on their arrow-heads is due to the somewhat similar physiological tongue test. Using the frog test no confusion between the two could arise. There is no anæsthesia with croton, and to an "educated tongue" the burning, tingling sensation is different.

It would seem, then, that the "arrow poison" is a paste made by pounding the soft parts of the *Croton tiglium* plant, and not obtained from the seeds.

"Journal of Hygiene," Plague Supplement I., 1912.

Plague.—The sixth report on plague investigations in India published as a supplement of the *Journal of Hygiene*, contains the following papers: Major George Lamb, M.D.Glasg., I.M.S., with portrait (Obituary Notice); Epitome of some Recent Observations on Rat Fleas; Preliminary Observations on the Protective and Curative Value for Rats of the Serum of a Horse Immunized with a Toxic Nucleo-protein extracted from the Plague Bacillus, by Sydney Rowland; Second Report on Investigations into Plague Vaccines, by Sydney Rowland; Statistical Investigation of Plague in the Punjab, second report, On the Connection between Proximity to Railways and Frequency of Epidemics, by M. Greenwood, jun.; Statistical Investigation of Plague in the Punjab, third report, On Some of the Factors which Influence the Prevalence of Plague, by M. Greenwood, jun.; Observations on Plague in Eastern Bengal and Assam; Observations on the Breeding of *Mus rattus* in Captivity.

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THE JOURNAL OF

Tropical Medicine and Hygiene

MARCH 15, 1912.

"THE PREVENTION OF FILARIASIS."

IN another part of the JOURNAL will be found an annotation on a paper by the late Dr. Thos. L. Bancroft, of Australia, on a proposed technique for the prevention of dengue fever and filariasis. In it will be seen the statement that prophylactic measures have several times previously been urged upon the Government of the day in Australia, but that they have never caught on. This, unfortunately, is what has happened in other parts of the world as well. Attempts were made to institute a campaign against filariasis in Barbados as long ago now as 1900, but somehow or other, though considerable trouble was taken in instructing the people on the subject, the matter fell flat and did not progress past the initial stages. Why should this have been so? Many reasons may be adduced. Filariasis is a disease, for example, which it is distinctly difficult for the ordinary medical practitioner to grasp the details of, and therefore consequently it must be even more difficult for the layman to do so. People can appreciate the dangers and devastations of yellow fever, an acute disease, which rapidly carries people off, and which spreads panic throughout the towns or districts in which it has broken out. They can also appreciate malarial fever, a disease which, though less acute, is nevertheless severe enough, and may cause a quite considerable death-rate. But when it comes to filariasis, a very chronic complaint, the symptoms of which may not appear for long years after, then appreciation diminishes and generally entirely disappears. Now though filariasis does not attack large numbers of persons at the same time, nor acutely, nor requires the place where it is prevalent to be put in quarantine, a most important point, yet for the individual it is a much more important disease than either yellow fever, dengue or malaria, because when once acquired there is no known cure, and the tortures and disfiguration the unfortunate individual may undergo are endless. It has been suggested, or even more or less definitely laid down, that the *Filaria Bancrofti* does not usually cause pathological symptoms, that, in short, it may go on living in complete harmony with its host. Recent work and observations have, however, thrown doubt upon this idea, and have, in many other instances, shown it to be erroneous. An infection with *Filaria Bancrofti*, especially a heavy one, certainly does one no good, and it may do one no end of harm. Sufferers from the various lesions produced are not visible to the public unless it be in the case of beggars and other paupers with elephantiasis and other lesions of their limbs. But go behind the scenes, and get a doctor practising in the infected area to show you his private cases, and then an idea can be got of the troubles filariasis causes. It is no exaggeration to say that it is quite as bad a disease as leprosy, causing in many instances far more pain and also as much or, in many instances, more deformity. Drs. Jackson and McLean have appreciated these points for Brisbane, and, as the late Dr. Bancroft says, Queenslanders are greatly indebted to these two men for their zeal in demonstrating the increase of filariasis in Australia and also for their attempts to get the Government to move in the matter of mosquito destruction. It is not as if the prevention of filariasis necessitated special methods and great extra expense; much, if not all of the work, can be, and is, done in the war against other mosquito-borne diseases, such as dengue and yellow fever. Though the *Stegomyia calopus*, the carrier of the latter disease, does not act as a spreader of filariasis, yet as its habits and breeding-places are very similar to those of *Culex fatigans*, the chief carrier of *F. Bancrofti*—both being domestic mosquitoes—then war against one destroys to a greater or lesser extent both. The main breeding-grounds of the *Culex fatigans* in Australia would seem to be the water-tanks, and this is often their chief breeding-place in other Colonies as well. Every owner of a water-tank, as the late Dr. Bancroft says, must be compelled to have it screened in a perfect manner, and keep it so screened. The whole question is one of the destruction of domestic mosquitoes, and this, as compared to the destruction of anophelines and

other wild or country breeds of mosquitoes, is a mere flea-bite indeed, and one that can be carried out at infinitely less expense. As to the question of making filariasis a notifiable disease, undoubtedly this is the ideal thing to aim at, and for a place like Brisbane there should be no very great difficulty in doing so. Of course, the difficulty, even for Brisbane, would be finding the carriers—people with no symptoms but yet with embryos in their blood—and this difficulty for native populations, such as the negroes in the West Indies, would almost be insurmountable. In the same way, having found that a negro was a carrier, it would be practically impossible to make him sleep under a mosquito net, or to explain to him the danger he was to other people. That will always be the difference in dealing prophylactically with white and native populations. The real prophylaxis of filariasis must depend, therefore, on the destruction of the intermediate host, *Culex fatigans*, or whatever other mosquito is spreading the parasite in any given area (*Stegomyia pseudoscutellaris* in Fiji, for example), and to do this, as has already been indicated, is by no means a hopeless task. In addition to general prophylaxis, however, personal prophylaxis for the white individual and educated native, until we reach the ideal state of having destroyed all the intermediate hosts, is of the greatest importance. Sleep in a properly fitting mosquito net at night and there is very little risk of becoming infected with filariasis, even though living amongst a highly infected native population. Now that the question of the prevention of filariasis has been definitely raised again, it is sincerely to be hoped that this time it will catch on, and that attempts will be made to minimize this loathsome disease in other parts of the world as well as in Australia. A definite systematic campaign against filariasis would be a fitting monument to the memory of the late Dr. Thomas Bancroft and his illustrious father, both of whom have done so much to further our knowledge of the life-history and pathology of one of the most destructive of human parasites.

G. C. L.

Annotations.

The Prevention of Filariasis.—The Australasian Medical Gazette, January 27, 1912 (vol. xxxi, No. 4), publishes an article on "a proposed technique for the prevention of dengue fever and filariasis," a paper communicated to the Queensland Branch of the British Medical Association by the late Thomas L. Bancroft, M.B.Edin.

"Queenslanders," the late Dr. Bancroft says, "are greatly indebted to Drs. Jackson and McLean for their zeal in repeatedly demonstrating the increase of filarial disease in Brisbane, and also for their endeavours to induce the Government to take up mosquito extermination. The advocacy of Sir William McGregor and the sympathetic attitude of the Government towards science, together with the general prosperity of the country, make the present a most opportune time for initiating a crusade against the mosquito, particularly in coastal towns."

"Prophylactic measures have several times previously been urged upon the Governments of the day, but they have never 'caught on.' Filarial disease might easily, however, be stamped out in Queensland were measures enforced on the lines here detailed, carried out."

"Unfortunately two notoriously bad insects have been introduced into Australia, namely, the house mosquito (*Culex fatigans*) and the tiger mosquito (*Stegomyia fasciata*). They came in ships' tanks, and found a congenial home. These mosquitoes never go wild. They breed in water receptacles in and about habitations. They are instrumental in the propagation of a number of diseases, both of man and the domestic animals.

"The first thing," the late Dr. Bancroft thought, "that should be done is to compel plumbers to construct water-tanks on the following lines: The old idea of a funnel-shaped piece of perforated iron or zinc fitted to the manhole is a bad one, for the reason that dirt from the roof finds its way into the cone, and there corrodes the zinc, a hole resulting through which even frogs may enter the tank. Furthermore, when the tank is full pigeons and sparrows bathe in the cone, and algæ grow freely. Another bad practice is the fixing of a collar round the manhole; this presumedly is done to assist the water from the spout entering the tank, but it imprisons feathers, leaves and birds' dung.

"Nothing is required except a flat sheet of perforated zinc to cover the manhole, which should be soldered to the tank. This sheet of metal is above the water and thus dry, and will last for years; anything in the shape of dirt from the roof lying upon it very soon dries, and is generally blown off, or, if seen, might be swept off. The adoption of this idea alone would reduce the mosquito incidence about a half.

"The overflow pipe should have an elbow attached, this preventing direct light entering the tank. When there is no elbow, mosquitoes enter through the large holes punched into the tank to constitute the overflow. Hailstones easily break perforated zinc; perforated copper would be better, and even copper wire gauze would answer, provided the mesh was not too small.

"Every owner of a water-tank should be compelled to have it screened in a perfect manner, and to keep it so screened.

"Filariasis," the late Dr. Bancroft thought, "should be made a notifiable disease. On receipt of a notification, the Commissioner would instruct a nurse or inspector specially appointed for this duty to visit the house, see the patient, if possible, and also the head of the house, and instruct them in the matter of it being absolutely necessary for the patient to be protected from mosquitoes at night. The patient should sleep under a perfect mosquito curtain, and so long as mosquitoes do not bite him he will naturally be unable to assist in the further spread of the disease. He will not re-infect himself, and in

five years or so he might be free from filariæ. If he were unable to buy a suitable mosquito net, the Government should supply the same. The nurse would make repeated visits at intervals of a month or so.

"At the present time it would be useless to make dengue fever notifiable, for the reason that medical practitioners call half a dozen different diseases by that name.

"If dengue could be recognized immediately it was introduced, quarantining the first victims in their homes, and a vigorous onslaught on mosquitoes in the surrounding houses would stamp the disease out. The quarantined persons should be compensated for any loss. Inspectors, whose duty it would be to visit each house and yard every fortnight, would be required. Ordinary labourers could be trained to be inspectors for this purpose. A short course of instruction for this purpose could be given them by the Government Entomologist.

"An inspector would examine every tank or receptacle for water, and see that it was securely screened. If it were not, it would be his duty to report to the Health Department, and the Secretary would communicate with the owner. If upon his next inspection the work had not been done, the Commissioner would be empowered to do the same and recover from the owner. He would visit the stable, fowl yard and fernery, and keep a look-out for mosquito larvæ and empty out the water should any be noticed.

"Putrid water from stables, bathroom, and that in cess-pits should have a little kerosene oil poured upon it every fortnight."

The above suggestions are sensible and to the point, and the Government should certainly act upon them. The dangers of filariasis are greater even than malaria, and all countries where the disease exists should attempt as far as possible to stamp it out. In the West Indies a campaign against the *Culex fatigans* acts in many instances against the *Stegomyia calopus* as well, and so it is a case of killing two birds with one stone, viz., filariasis and yellow fever as well. The advance of mosquito prophylaxis in many of the British Colonies is still very slow, however, and until more urgent steps are taken, filariasis and other mosquito-borne disease will go on and multiply.

The Etiology of Blackwater Fever.—Brem, in the *Archives of Internal Medicine* for February, 1912, discusses the etiology of what he terms the erythrolytic hæmoglobinuric type of blackwater fever. The paper was read at the eighth annual meeting of the American Society of Tropical Medicine, at New Orleans, on May 18, 1911, and is now reprinted in the *Archives*. Brem believes that a consideration of pernicious malaria with hæmoglobinuria, and the transition cases between it and erythrolytic hæmoglobinuria, strongly inclines one to the belief that both forms are due directly to an hæmolysin produced by the malarial parasite. The æstivo-autumnal organism is nearly always the one concerned.

The mechanisms of the production of the two types are, it is thought, essentially the same, but differ markedly, as a rule, in degree.

The small amount of experimental evidence so far collected tends to confirm the above views.

One of two explanations may account for the irregularity and infrequency of hæmoglobinuria in malarial infections:—

(1) Different strains of parasites may generate hæmolysin that varies in quantity or intensity with the strain, or with environment that is inimical to the parasites, such as quinine or relative immunity to malaria resulting from previous infections.

(2) An antihæmolysin may be formed, as a rule, during the incubation period of malarial infections, when gradually increasing doses of parasitic hæmolysin are presumably being liberated. In this case quinine, exhaustion, exposure, &c., may inhibit the production of antihæmolysin, especially in debilitated persons who have suffered from previous malaria. In pernicious infections, antihæmolysin formation may be good, but the production of hæmolysin by enormous numbers of parasites may be sufficient to more than neutralize it.

Since the above was written, Zeiler and Brem have obtained two more extracts of parasites from different pernicious malaria infections. The extracts were made like the one in Brem's paper, except that grinding of the sediment with sand was omitted. Both of these extracts contained a fairly strong hæmolysin. Three parts of the extracts hæmolyzed completely one part of a 5 per cent. suspension of erythrocytes in from twenty minutes to one hour. The hæmolysin was thermolabile, its action was inhibited by one part of serum from normal persons, from one patient with pernicious malaria (the patient from whom one extract was obtained), and from two patients with erythrolytic hæmoglobinuric fever. The antihæmolysin in these serums was thermostabile. The serums were treated with quinine and tested for antihæmolytic properties. The normal serums were unimpaired, but the serums from erythrolytic hæmoglobinuric patients seemed to be weakened by the same quantity of quinine, and in one instance hæmolysis was complete in one hour. The experiments need confirmation, and the authors hope to be able to report more exact quantitative work. The experiments, however, seem to reconcile the malarial and quinine views of erythrolytic hæmoglobinuria, and to connect it definitely with malaria. The therapeutic measure of transfusion with normal blood, the authors think, is obviously suggested.

Undifferentiated Tropical Fevers in India.—B. P. Chundanani, L.M. & S. Univ. Bombay, in a communication dated Sukkur, Sind, India, deals with "an epidemic fever of a hitherto uncertain and undifferentiated nature," which occurred in Sind in the summer of 1911. The cause of the fever in question is attributed by Dr. Chun-

danani to "a parasite infesting the intestines and causing a moderate irritation around the alimentary canal." This undifferentiated fever is attended usually by a low tropical fever; the temperature rises during three and a half weeks, gradually during the first half of the period, and then is followed by a similarly gradual fall. The difference between the morning and evening temperature is almost 1° throughout, the evening record being the higher. The maximum temperature attained in the low fever type was 102° F. The intestinal parasite described by Dr. Chundanani as being constantly present in the fæces is a motile, homogeneous body, oval, with a "tail" or flagellum by which movement is effected. The bodies are smaller than red blood corpuscles, and the tail can be retracted and protruded. It is scarcely necessary to say that the richness of the intestinal flora in bodies of a nature similar to those mentioned by the writer renders an expression of opinion on this matter out of the question.

Abstract.

VERRUCA PERUANA.*

By S. T. Darling, M.D.
Ancon, Canal Zone.

Darling points out that this disease is interesting from several points of view: to the parasitologist on account of the peculiar bodies in the erythrocytes, and on account of its probable transmission by ticks or other suctorial invertebrates having a peculiar geographic and altitudinal distribution; to the hæmatologist, on account of the remarkable blood picture in the malignant form of the disease, there being a profound anæmia; to the physician and quarantine officer, from the fact that the disease is rife in certain districts in Peru, where Americans have commercial interests and where American physicians and engineers, bridge-builders and other mechanics have occasion to pass through or work within infected zones. Convalescents occasionally return to the United States with some evidences of the disease still present on their persons.

Geographical Distribution.

Verruca peruana is an infectious disease in which a fever of irregular type, associated with more or less severe anæmia, is followed by a wart-like eruption of the skin, and sometimes of the mucous or serous membrane.

Formerly, it is believed, the disease had a much wider distribution than it has to-day. It is now encountered in certain narrow valleys on the western slopes of the Peruvian Andes, between latitudes 8° and 13° South, and at altitudes of from 1,000 to 12,000 ft. It is distributed along narrow tributaries which drain into rivers flowing into the Pacific. The disease is never contracted in the lower coastal plain, but always up in the valleys at the higher altitudes mentioned, not less than 28 to 60 kilometres (16 to 36 English miles) from the sea. Neither does it cross the divide, for it is unknown on the eastern face of the Andes. It is encountered oftenest at altitudes of from 2,000 to 6,000 ft.

The chief endemic areas are to be found in the departments of Ancachs in the Province of Huarez; and in S. Bartolomé, Casapalca, Chosica, and Santa Eulalia in the Department of Lima.

The mortality from verruca was so great during the construction of the Oroya Railroad, which extends from Lima to the Cerro de Pasco mines, that one of the large bridges crossing the river is known generally as "Verruca Bridge."

Peruvian physicians believe that only by sleeping in an infected district or by passing through it at night can the disease be contracted; and it is generally believed that the disease is transmitted by the bite of an insect. This naturally suggests a carrier in the shape of a tick or mosquito, or other suctorial invertebrate having a peculiar altitudinal distribution.

Classification.

Two forms of the disease are recognized: the malignant and benign.

Malignant Form.—This is known as "Oroya fever," "Carrion's fever" or *fiebre grave verrugas*. The initial stage of this form corresponds with that usually noted in severe acute infections. The second stage constantly exhibits fever of an irregular remittent or intermittent type. There is a rapidly progressive and severe anæmia, the erythrocytes falling below 1,000,000, sometimes even to 500,000 per 1 c.mm. There is poikilocytosis, polychromatophilia, enormous numbers of nucleated red cells, leucocytosis and high colour index. Coincident with the anæmia there is vertigo, great restlessness and air hunger. The sensorium is always clear and the mortality very high. The third or eruptive stage occurs in the small percentage of patients who recover from the *fiebre grave*.

Benign Form.—In this group Barton places the milder form of verruca infections. They are quite common and the mortality is low. The symptoms are more undefined and the patients usually follow their vocations. The anæmia and fever are moderate, and the eruption is more frequently of the nodular type and lasts longer than in the malignant forms.

The second stage is followed by the skin eruption which appears first as an exanthem of small, purplish-red spots, which become papular and later develop into warty excrescences occasionally of large size, having a tendency to spontaneous

* A Paper read in the Section of Pathology and Physiology of the American Medical Association, at the Sixty-second Annual Session, held at Los Angeles, June, 1911. Published in the *Journal of the American Medical Association*, vol. lvii, No. 26. December 23, 1911. P. 2071.

hæmorrhage. The lesion may occur on the mucous or serous membranes and deep subcutaneous tissues. After lasting for from four to six months, the eruption disappears by involution or ulceration.

The period of incubation, if we consider the experiment of Carrion, is about twenty-one days.

There is no natural immunity to the disease of any kind—race, age or sex. Scheube says that infants have been born infected with the disease.

Duration.

The duration of the disease varies considerably, being a couple of weeks in the *fiebre grave*, to months and years in the other forms. The mortality among natives is said to be 10 per cent.; among whites 40 per cent. In the Oroya fever, however, it is 85 per cent. to 90 per cent. Frequent complications are septicæmia, exhaustion, anæmia, infections by the typhoid-colon group of bacilli and tuberculosis.

Etiology.

The infectious nature of the disease was demonstrated in 1885 by Daniel Carrion, a young Peruvian medical student, who inoculated himself in both arms with blood taken from warts. After a latent period of twenty-one days, he entered the febrile stage of the disease and died eighteen days afterward of *fiebre grave*, before the development of the eruption.

In verruca several strains of paracolon bacilli have been isolated by Barton and Biffi from patients suffering from *fiebre grave*, and also from cadavers in cases of the same disease; just as in yellow fever, varieties of paracolon bacilli, having been obtained from yellow-fever patients before and after death, were thought by competent observers to be the cause of the disease.

In 1900, Barton called attention to the existence of infections by members of the typhoid-colon group of bacilli in patients suffering from verruca. These infections were noted during the course of an attack of verruca, particularly toward the end of the second stage, and during the eruptive process. Barton believes that the "typho-coli infections" alter the symptomatology of verruca and aggravate its progress to a considerable degree.

Biffi reports isolating two strains of bacilli, one resembling *B. paratyphosus*, Schot, the other Gaertner's bacillus.

To those who have had any experience with infections by members of the typhoid-colon group in the Tropics, and in view of our knowledge of the history of the relation of *B. icteroides* and *B. x* of Sternberg to yellow fever and the relation of the hog-cholera bacillus to true hog cholera, which, as De Schweinitz and Dorset have shown, is due to a filterable virus, these bacteriological findings of Barton and Biffi are very interesting, and they add another disease to the list of those frequently complicated by infections with bacilli of this group.

In October, 1905, Dr. A. L. Barton, of Lima, called attention to certain bacillus-like elements in the erythrocytes of two patients suffering from *fiebre grave de verrugas*. Later, in January, 1909, he described the bodies found in fourteen additional cases. Barton stated his belief that the bodies were protozoa and were the specific agents of the disease. Gastiaburú and Rebagliati, in October, 1909, confirmed Barton's findings.

Barton's views as to the relation of his intracellular *x*-bodies to verruca have not been generally accepted by European investigators; chiefly, Darling believes, for the reason that the latter have studied films in which the *x*-bodies were oftenest seen after they had "broken up." In this condition they are more nearly like basophilic granulations.

The *x*-bodies of Barton appear in the blood in the "severe wart fever" and disappear about the time of the appearance of the eruption. They are always seen first as slender rod-like forms with rounded free ends. They are situated within the erythrocytes but, according to Barton, cannot be detected in the fresh blood; consequently their refractive index must coincide with that of the erythrocyte. They are stained best with Giemsa stain, but not quite so well with other stains of this class when stained by the ordinary methods. One or both ends may take the stain a little more deeply than the rest, or a deeply staining swollen dot may sometimes be seen between ends. The rods are occasionally single, though oftener two or more, up to six or eight, may be seen, frequently grouped in parallel series, or in such manner as suggests, according to Barton, a process of reproduction. Filaments or irregularly disposed branched or pseudo-branched forms are seen. The rods are generally slightly curved, and when the erythrocyte containing them is torn, while making the smear, the bodies can be seen to preserve their morphology and staining characters outside the cell. They stain a dark blue or purple; never faintly blue, with sharply differentiated chromatin substances. In this respect they differ from protozoa and give the impression of being more like spirochætes than any other known type of micro-organism. After a few days they are seen to lose their slender rod-like shape and become more irregularly swollen, distorted and fragmented. At this time they usually take the stain more deeply.

When the disease progresses favourably, the bodies disappear and the eruption comes out. If the bodies are seen to reappear in their slender rod-like form, it can be noted at the same time that the patient's symptoms have become more grave, and if the thin rod-like elements continue in large numbers in the peripheral blood, the patient dies. In these instances nearly every erythrocyte is invaded.

Barton states that the longest period the bodies have remained in the peripheral blood is twenty days, and that the recovery of the patient coincides with the disappearance of *x*-bodies from the peripheral blood.

Darling asks: What is the nature of the *x*-bodies? (1) Are they some form of basophilia or degenerative change of the erythrocytes, or are they nuclear

remnants? (2) Are they localized spots of degeneration of the erythrocyte, surrounding and obscuring a very minute or ultramicroscopic micro-organism? (3) Are they bacilliform *Babesia*? (4) Are they bacilliform bodies invading the erythrocyte, such as have been described by Laveran and Carini in lizards? (5) Are they related to the endocorpuscular bodies described by Graham-Smith in the red corpuscles of moles? (6) Are they some representative of the sporozoa?

Without going into a detailed discussion of this phase of the subject, Darling states that the slender rod-like *x*-bodies seem to him to represent some unique type of micro-organism, for there is nothing exactly like them in the annals of parasitology or hæmatology.

Blood Changes.

In the malignant form of the disease very remarkable changes are noted. Briefly, the chief characters are basophilia of the red cells, the presence of many nucleated red cells, *x*-bodies in various stages, and numerous marrow-cells, all rapidly escaping from the marrow before they have reached the mature type seen in the peripheral blood during health.

The red cells show much basophilia, blue basophilic punctations and red nuclear remnants. There are crises in which enormous numbers of nucleated reds, chiefly normoblasts, are seen. There is much basophilic punctation of those nucleated reds which show a polymorphous or budding nucleus. Many microcytes and macrocytes are seen, and there is some agglutination of the red cells.

With regard to the leucocytes, there is a leucocytosis from time to time with the appearance of marrow-cells of various types, such as myeloblasts, neutrophilic and mast myelocytes, transitional leucocytes, and polymorphonuclear leucocytes with bluish-green granules. There is a diminished number of eosinophiles.

The blood-platelets are notably diminished in number and have lost to a considerable degree their power of agglutination.

Prophylaxis.

As the disease is limited to certain endemic regions, and is generally contracted at night, it may be prevented, of course, by keeping out of the danger zone. During 1909 an American bridge company undertook the construction of several bridges on the Oroya Railroad. The engineers and workmen engaged in putting up the first of these structures encamped within a verruca zone, and suffered much from the disease. At the suggestion of Dr. Barton, it was arranged that the men should sleep in a place a few kilometres distant, out of the endemic district, while they continued their work in the daytime as usual. From that date there were no new cases. Peruvian physicians are quite alive to the economic importance of this disease and we may expect them to determine in due time the mode of infection and the true pathogenic agent, thus establishing a means of preventing the ravages of this tropical scourge.

In conclusion, Darling believes that whatever the final opinion with regard to the *x*-bodies may be, the disease in all its aspects will amply repay careful study and research into the mode of transmission, relation of the *x*-bodies to the different clinical phases of the disease, the pathology and treatment.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the Journal of Tropical Medicine and Hygiene *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"Lancet," January 6, 1912.

Bronchomycosis.—Castellani states that the fungi so far observed in Ceylon in cases of bronchomycosis are twelve different species of endomyces, the commonest being *Endomyces tropicalis*, *Saccharomyces Krusei*, various strains of *Actinomyces* and *Streptothrix*, fungi of the genera *Aspergillus* and *Penicillium*, and several other fungi which so far have not been determined. As regards the pathogenicity of the fungi found it would seem, from some researches Castellani has carried out, that the pathogenicity of *Endomyces tropicalis* and of the fungi of the genera *Aspergillus*, *Penicillium*, *Streptothrix*, and *Actinomyces* is practically certain.

"Lancet," January 20, 1912.

Intestinal Myiasis.—Cockayne reports an English case of this condition. The child, a boy, aged 1 year and 2 months, was brought because his mother, very much alarmed, noticed that when she lifted him up from the bed, there were a number of living "worms" under a small piece of flannel upon which he had been lying. More of these where found whenever he was left on the bed, though none were noticed elsewhere. The greatest number, probably about 50, were seen in the morning, and always under the flannel or mackintosh upon which he had been left all night. Fewer were found in the same situation during the day. The mother said that there were never any in the napkin, and that the stools were always free from them, and that they were found even when the child had not passed a motion. The infant, though rather poorly nourished, had remained in his usual health and had had no sickness, constipation, diarrhœa, abdominal pain, or loss of appetite.

Mr. Austen, to whom the larvæ were sent for identification stated that they belonged to *Musca domestica* (Linn.), the common house-fly, one larva of *Fannia canicularis* (Linn.), the small house-fly, also being present. The condition is not very uncommon, larvæ of many different flies having been found in cases of intestinal myiasis in Europe and North America.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the Journal of Tropical Medicine and Hygiene should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

DEEP SUPPURATION OF THE THIGH ASSOCIATED WITH A PECULIAR BACILLUS.

By Henry Harold Scott, M.D.
Bacteriologist to the Jamaica Medical Service, Jamaica.

The following account has been written for three reasons—firstly, to place on record a condition which, if I have ever met with it previously, I have passed by unnoticed; secondly, to stimulate investigation by others who may be likely to come across similar cases, with a view to the elucidation of what may be a hitherto undescribed affection; and thirdly, to obtain refutation if the condition is merely an old one under an unusual guise.

The affection is, apparently, a very definite one, and, moreover, one which I do not think would be overlooked if attention happened to be called to it; and although I can find no description in the text-books at my disposal, nevertheless the condition is probably not rare, since I have met with three cases during a period of about five weeks.

Without further preface, I will proceed to relate the histories of the three cases, and the circumstances under which the associated organism was detected.

(I) R. A., female, aged 34.—On August 27, 1911, a small tube of her blood was sent to the laboratory from the other end of the island in order that her serum might be tested by Widal's reaction for typhoid fever. She was said to have been ill with fever for about ten days to a fortnight before admission to the local hospital (August 22). The medical man in charge of the patient (Dr. Thomson, of Montego Bay) added a note to the usual short statement sent with specimens for examination: "Symptoms appear to me more those of a *streptococcal septicæmia* than true enteric."

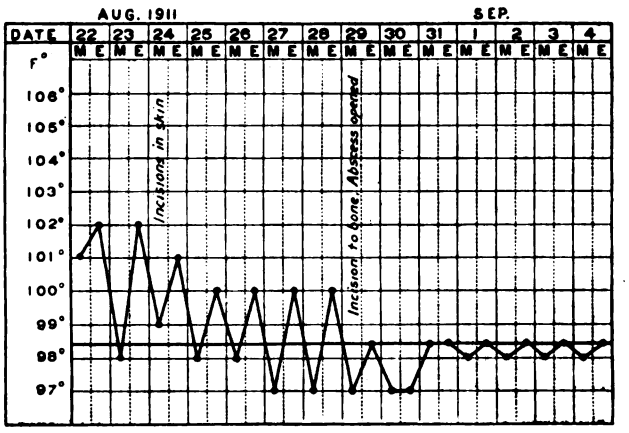
When the preparations for the agglutination tests were placed under the microscope, I noticed amongst the typhoid bacilli two or three large square-ended rods, distinctly motile, but moving in a more stately, slower manner than the typhoid bacilli in the field, reminding one rather of a man-of-war amongst torpedo boats. The motility was quite obvious, the bacilli passing right across the field, thrusting the smaller typhosus aside in their course. None such had been seen in the control typhoid bacillary emulsion, so, thinking that possibly some contamination had occurred, I asked Dr. Thomson to send another specimen, taking it with the most careful antiseptic precautions. As this would take a couple of days to arrive, I meanwhile dropped the remainder of the blood in the tube into nutrient broth, and placed it in the 37° C. incubator. There was a very fair growth by the following day. A description of it will be given later. The serum had given negative results with the agglutination tests with both typhosus and paratyphosus.

Two days later (August 29) the fresh specimen arrived, and on placing the contents of the tube in nutrient broth a similar growth occurred within twenty-four hours. I then wrote asking for a detailed history of the case, and the medical attendant kindly sent the following reply:—

"The patient had always been in good health until two weeks before she came to hospital" (that would be about August 10), "when she felt a burning in the skin of the right thigh posteriorly. She is accustomed to ride on a pack-saddle on a donkey, and had been doing so a couple of days previously. The burning increased, and the part became swollen and hard, with great pain and fever.

"On admission she had a temperature of 102° F., and there was a hard brawny swelling in the skin of the thigh, reaching from the buttocks to the lower third of the thigh behind; she complained of great pain, and could not sleep. Deep incisions were made, but no pus found. Temperature, 98.4° F. in the mornings, rising to 102° F. in the evenings. This continued for a week, when another incision was made down to the bone, and a large deep-seated abscess of slate-coloured pus—no odour—was evacuated, containing not less than a quart of pus. Temperature has remained normal since. There was no abrasion of the skin when she was admitted, and no discoloration, and she says that she could find none before coming to hospital."

Unfortunately none of the pus was saved for examination.



Case I.

In response to my further inquiries for other details of the history, Dr. Thomson wrote on September 21: "I have tried to get a fuller history, but to no purpose. She says she was perfectly well until the fortnight before coming up to hospital; that about two or three days after the ride on the donkey she felt a 'burning' in the skin of the thigh. The burning increased to severe pain and prevented her sleeping, and was accompanied by fever.

"She has made a rapid recovery, and has left

the hospital, the wound being quite healed. Examination of the skin when she was admitted showed no abrasion nor marks of a bruise, the skin and underlying cellular tissue being hard and brawny like leather; pain increased by handling. Incisions going down to muscle showed no pus, only thin serum (this was done on the 24th). Later (29th) she was chloroformed, and incisions were made down to the bone, opening into a large abscess (? beneath the periosteum); there was no fluctuation at any time. I enclose a chart of her temperature while in hospital."

(II) L. D., male, aged 34 years.—This patient was very ill on admission, and the history obtainable was somewhat meagre. As far as could be made out, the patient had not been well for two months, and during that time, or at least the last four or five weeks of it, his right thigh had been painful and swollen; no history of any trauma. He was admitted to hospital (September 18) very ill, and, apart from the very low general state, there were no symptoms except local ones. On September 20 a tube of his blood was sent up, and the serum was tested for agglutination of *B. typhosus* and *B. paratyphosus*. A marked positive reaction was given: 1—30 in 10 minutes, 1—50 in 15 minutes, 1—100 in 25 minutes with the former organism. While watching for the reaction to take place, again a few of these same bacilli were noticed in the serum moving about among the typhoid organisms; some blood taken aseptically from the finger was inoculated into nutrient broth and placed in the thermostat at 37° C. By the following day a good growth had taken place. The positive Widal reaction was puzzling, as the patient denied having suffered from any illness of a febrile nature. As the thigh swelling had increased and was very painful, deep incisions were made down to bone, but revealed no pus; the shaft of the femur was roughened, and the overlying mass of tissue was friable and considered by the surgeon to be of the nature of a gummatous infiltration. The patient went rapidly downhill and became unconscious, death being expected every minute, but he lingered on for another forty-eight hours, dying at 2 p.m. on Saturday, September 23.

Post mortem at 3 p.m. the same day, *i.e.*, one hour after death. Body emaciated, right thigh much swelled, measuring 21½ in. in circumference, while the left at the same level was only 16½ in. Except for the incision made at the operation, there was no external sign of injury. There were old, tough adhesions of the left pleura, no fluid, and a thickened pericardium, and within the latter about 4 oz. of a straw-coloured fluid. The heart itself appeared small and contracted, but there was no valvular mischief. Lungs showed nothing abnormal. *Spleen* was large, and weighed 11 oz., was congested and perhaps a little more friable than normal, but showed no other apparent abnormality. *Liver* small, weight 37 oz. *Kidneys*: Left weighed 4 oz.; right, 3½ oz.; capsule stripped readily. In the small intestine, 2 to 3½ ft. from the ileo-cæcal valve, were five typhoid ulcers, three partially healed and two in an earlier stage; no signs of any hæmorrhage or perforation.

The right thigh showed an incision extending down to roughened bone, the overlying tissue being very friable; no pus found.

Blood was taken by aseptic puncture from the heart, samples from the spleen, pulp, lungs, liver and contents of gall-bladder; cultures in broth were set going of each, and smears were also made from each organ. Tissues were taken for section of the spleen, liver, kidneys, thigh tumour, bone-marrow of the affected thigh.

With regard to the cultures made from the heart blood, spleen pulp, liver, gall-bladder, &c., of this case: No growth was obtained from the first named; that from the spleen gave a mixture of typhosus and the bacillus described, the former being separated by subculture on Fawcus's medium, and the latter by heating a subculture in broth to 80° C. for ten minutes, and so leaving the spored organisms which grew readily afterwards in pure culture. From the gall-bladder the *B. typhosus* was obtained, but not the other, while from the marrow of the right femur a very good growth resulted.

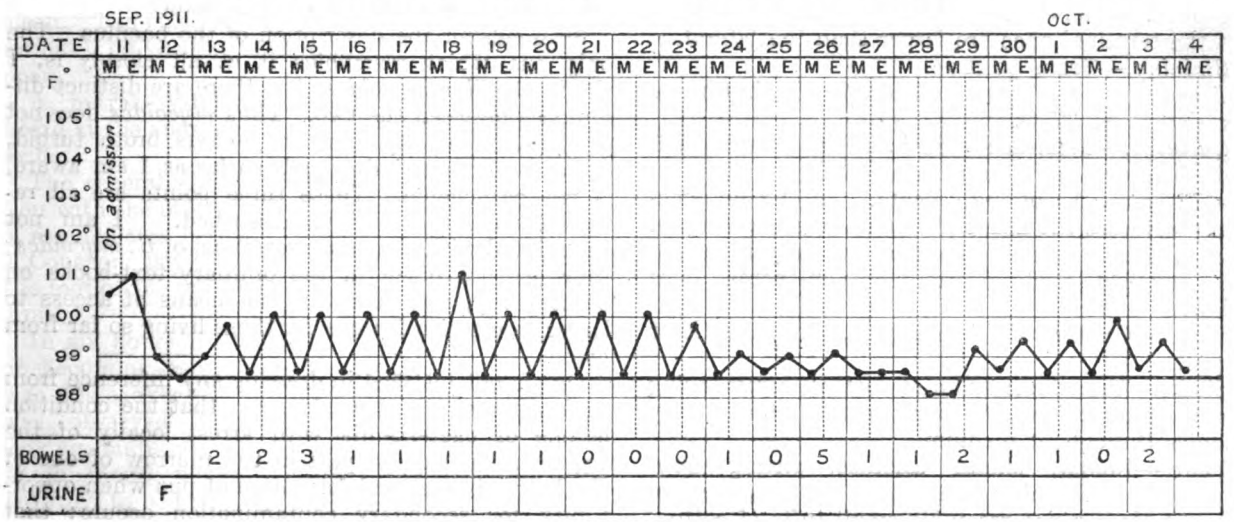
(III) The history of the third case is as follows:—

T. T., aged 32 years, male; admitted to hospital September 11, 1911, with a very painful left thigh. This part was swollen, and movement or palpation caused increase of the pain. The swelling was situated at the middle third of the anterior aspect and was brawny in nature. The pain was worse at night. He had a "chancre" five years ago. The pain and swelling began, as far as the patient is aware, about the same time, four weeks previous to admission, and had gradually increased without any remission. The case was diagnosed as gumma of the thigh, and patient was given potassium iodide. After eleven days of this there was no improvement at all; the temperature kept up, the pain increased, patient could not turn in bed unaided, and any attempt at movement caused him to cry out with acute pain, and he was unable to get any sleep.

A specimen of his blood was sent up, more as a matter of curiosity, on account of the resemblance betwen his symptoms (continued fever and a swollen painful thigh) and those of the cases cited above, and within twenty-four hours of inoculating nutrient broth a good growth occurred, as described below. Another specimen, taken a week later, yielded similar results. During the ensuing week he left hospital at his own request, as he stated that he was feeling no better, and inquiries made at his home address given on entering hospital were unsuccessful. I found later that he had shortly afterwards gone to the Poor House Infirmary. On October 11 I went to see him there with Dr. Edwards, the Medical Officer to that institution. His condition had become aggravated; the pain was incessant, unless allayed by morphia,

he could not raise himself in bed, nor turn, nor get any relief in sleep. The swelling had increased, affecting the anterior and adjacent part of the internal aspects of the thigh from the junction of the upper and middle thirds to the knee. Temperature varying from 98.4° (rarely) to 101° F. I took another specimen of his blood and inoculated it into nutrient broth. By the following day there was a good growth of the bacillus in pure culture.

I again saw the patient on October 14; the leg was swollen to the foot, but the thigh was the only part causing pain, though there it was very acute. Deep incisions were made and carried down to the bone, but only blood-stained serum was obtained, as in the first case; some of this was collected and examined, and some put in broth for culture. The bacillus was found to be present in pure culture in this as in the blood obtained by puncture of the finger. "Subsequent to the operation the temperature rose each evening to between 100° and 101° F., and fell to normal, or nearly so, in the morning. For the first three days, till October 17, the pain had been a little easier; it then again returned and was agonizing from the 18th to the 22nd, when the patient died, a week after the operation. During this time there was abundant oozing of thin, blood-stained serum, but no pus until the last twenty-four hours." I could not obtain a more detailed account than the above. As in the first case, therefore, pus appeared to form some five to six days after the first incisions, the discharge in the interval, which was abundant, consisting merely of this thin watery sanguineous fluid.



CASE III.

By kind permission of Dr. Edwards, I was present at the *post mortem* on October 23. On exploration of the wound in the leg, a large abscess was opened containing odourless "slate-coloured" pus, as in the first case; the quantity evacuated was estimated to be between 1½ to 2 pints; some of it was collected. The abscess extended to roughened bone as in the others. Other differences between the conditions found in this case and those in the second were: The spleen was very slightly enlarged, if at all; the lungs and pleuræ were quite healthy; and the intestine was normal. There was some straw-coloured fluid in the pericardium (3 to 3½ oz.); heart, liver, kidneys, and other organs all apparently normal.

Smears were made of the heart blood, spleen, pulp, marrow, &c., as in the former case, and of the pus, and cultures of the blood drawn aseptically by pipette from the heart cavities (the blood was quite fluid even so long as this after death), of the spleen pulp, of the pericardial fluid, of the marrow, of the gall-bladder contents, and of the pus were made.

Whereas in the former case the culture from the heart blood remained sterile, from that of this last case a growth was obtained of the new bacillus together with a few streptococci and staphylococci. Similar growth resulted with the spleen and marrow. From the pus the organism was readily cultivated, though, as would be expected, the contamination by staphylococci and streptococci was greater. From the serous fluid only the bacillus described was obtained, no pyogenic organisms; while, lastly, from the contents of the gall-bladder no growth was obtained.

I am told by a medical man practising in the island that he had a very similar case some time ago in which the humerus was affected, that is, there was a painful swelling with fever, and on incising merely serous fluid was evacuated until five or six days later when slate-coloured pus appeared to form; but as the condition was not verified by bacteriological examination there is no proof that it was the same.

The following is a description of the bacillus so far as I have been able to study it up to the present:—

Morphology.—Bacillus, 1.5—3.5 microns long,

0.6—0.8 microns broad, straight or occasionally very slightly curved, square ends in fresh culture, but after four days involution forms occur in which one end may be larger and swollen. May be swollen or in chains. Aerobic and facultative anaerobic. Spores central, or slightly nearer one end than the other, of less width than the bacillus, so that no bulging is produced; sporing takes place only under aerobic conditions.

Motility.—Markedly motile in vegetative form, but motility lost as soon as sporing takes place; thus, in a hanging-drop from a broth culture taken near the surface, motile vegetative forms and non-motile spored forms may be seen. Motility is present when single or in short chains of two or three and perhaps four, but apparently not in longer chains. On staining by the method of Stephens, the bacillus shows numerous flagellæ, peritrichial, but the terminal ones are larger than the lateral.

Staining.—Gram positive.

Temperature.—Grows well at 22° C., but more luxuriantly at 37 C.

Cultures.—Gelatine: Stab.—Film formation, whitish grey, with funnel-shaped liquefaction in 48—72 hours, becoming saccate. As the liquefaction progresses the film sinks and a fresh one forms. Spored bacilli seen in the film and upper part of the liquefied medium, motile non-spored ones below.

Slope.—Gutter of liquefaction, if tube kept sloped.

Shake.—Translucent film at surface, commencing liquefaction in twenty-four hours; small hazy colonies throughout medium.

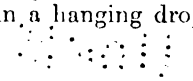
Plate.—Round, ciliate colonies, pitting from liquefaction beginning in twenty-four hours; when grown to larger size resemble small tufts of cotton-wool.

Agar: Stab.—Grey-white thin pellicle, and growth all along the line of the stab, not fir-tree growth, but evenly spread out.

Slope.—Abundant growth in twenty-four hours, white, shining, moist-looking, "tallow-candle"-like, but slightly more translucent. Viewed from behind, shows dense centre, with edges like teased cotton-wool. After twenty-four hours very many have spored, and after forty-eight hours hardly any non-spored bacilli are seen, and there are very many free spored.

Plate.—Colonies white, denser in the centre, like cotton-wool with teased edges. Impression colony shows long wavy chains under $\frac{1}{6}$ in. objective, and "Medusa head" edges under low temperature ($\frac{2}{3}$).

Bouillon: Grows well; thin pellicle forms in twenty-four—thirty-six hours, very easily detached on moving the tube, when another film forms, so that after three days there is a thickish deposit at the bottom, the broth remaining clear. Sporing occurs at the surface, so that if a loopful be taken from the depth of the culture, as stated above, motile non-spored and non-motile spored organisms are seen in a hanging drop.



Potato.—Copious, white, shiny growth.

Litmus Milk.—No change for twenty-four hours, then there is a separation into flakes or small clots in four days, with acidity.

Peptone Water.—Marked production of indol in three days.

Neutral red is unchanged.

Sugars.—There is a marked acid change in glucose, less but still marked in saccharose; very faint reddening of litmus in lactose, mannite, raffinose, and galactose; no change in dulcite. In none of the sugars was there any sign of gas production.

Inoculation into the peritoneal cavity of a guinea-pig was not fatal unless large amounts were used of a broth culture (some 6—8 c.c.), and even then nothing particularly characteristic was seen *post-mortem;* spleen was not enlarged. Further inoculation experiments are to be undertaken.

So much for the description of the bacillus. The only one which resembles it at all closely is, I think, *Bacillus mycoïdes;* but there are distinct differences between the two. Thus *mycoïdes* does not give rise to acidity in milk, renders broth turbid, does not produce indol, and, so far as I am aware, is not pathogenic. These three points are all reversed with the bacillus described. I am not acquainted with the sugar reactions of *B. mycoïdes;* they are not given in the ordinary text-books on bacteriology, and there are no means of access to larger works of reference for those living so far from home.

One is not justified in drawing any inference from so few cases, but it would seem that the condition is one of bacteriæmia with arrest locally of the organism at least in part in the marrow of one of the longer bones, and formation of pus when opportunity for secondary contamination occurs; that happened in five to six days in the first and third cases; the second died, probably from the associated enteric fever, too soon after the incision for pus to form.

Since the most striking feature of each of the cases (apart from the presence of the bacillus in the blood-stream) was the swelling set up apparently by the enormous quantity of thin serous fluid, if the organism has not been previously described and christened, I suggest tentatively for it the name *Bacillus seroficus.*

The condition having come to my notice accidentally, as it were, through the prolonged fever calling for a Widal reaction, and since it is probably not very rare, as I have met with three cases within a comparatively short time, I have ventured to make the matter known, in order that other medical men working in the Tropics may be on the look-out for similar cases, and by further investigations throw more light upon a subject which, however interesting from the point of view of the pathologist, is a tedious and distressing one from that of the patient and the medical practitioner.

A CASE OF SUPPURATION IN AN ENCYSTED HYDROCELE OF THE SPERMATIC CORD.

By J. R. D. Webb, M.R.C.S. and L.R.C.P.
S.M.O., British Guiana.

On January 12, 1912, a patient, C——, age 30, male, was admitted by me to the Colonial Hospital, Georgetown, Demerara, with a temperature of 102° F. The abdomen was distended, very tender on palpation, and a flat note obtained on percussion.

A small swelling in the right groin was observed, which the patient said he had noticed for one day. There was no vomiting, and a definite history as to the time at which the last stool was passed could not be obtained.

The tongue was moist and fairly clean. The pulse rapid (110 beats per minute), its volume, tension and force, poor.

A mitral systolic bruit could be heard at the apex, conducted into the axilla.

The general diagnosis on consultation with the other surgeons of the hospital was that of strangulated hernia.

Consequently the patient was treated by elevating the foot of the bed and an ice-bag was applied to the groin.

In six hours' time the swelling showed no signs of becoming reduced, so an exploratory incision was made over the lump. A swelling of the cord was observed surrounded by some gelatinous-looking material. No hernia could be discerned, so the incision was closed up and the patient returned to bed.

His condition became much worse, and he was treated with continuous warm normal saline per rectum, hot bottles, and brandy 1 oz. hourly.

The abdomen became very distended and dull on percussion, the pulse very poor and eventually intermittent; death occurring twenty hours after admission.

Autopsy.—On opening the abdomen purulent peritonitis was observed, more or less confined to the pelvic region, and on examining the right spermatic cord, a swelling, the size of a small hen's egg, was found situated just outside the external abdominal ring.

On making an incision into this, two well-formed cavities were observed with definite pyogenic lining to the walls and filled wth thin watery pus. Cultures taken from the pus in the cavities of the cord showed *Bacillus coli communis* in pure culture. Culture of the peritoneum showed *B. coli communis* in pure culture.

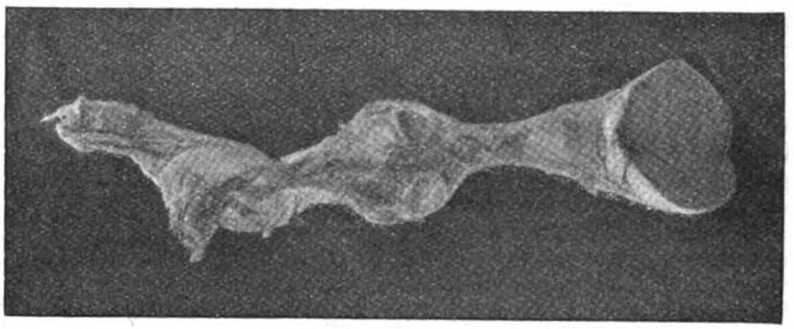
The left spermatic cord had a small lipoma attached to it in a similar position.

The spleen was slightly hypertrophied.

The lungs were congested, and the heart fatty with the valves fibrosed.

The kidneys were also fatty with early cirrhotic changes. With regard to the swelling of the right spermatic cord, the question of filariasis arose, but nothing to confirm this was forthcoming, as on examination of other glands nothing could be found, nor was the typical thickened appearance of the filarial cord present.

It would appear that the condition was an encysted hydrocele of the remnant of the *processus vaginalis*, which had become infected, and the purulent pelvic peritonitis which was found was secondary to the infection, having spread upwards by means of the lymphatics.



The accompanying photograph was taken after hardening the specimen in formalin for twenty-four hours.

GLORIOSA SUPERBA POISONING.

By Lawrence G. Fink, M.B., C.M.Edin.
Civil Surgeon, Myaungmya, Burma.

On September 9, 1911, at about 6 a.m., two Burmans, one aged 17 and the other 23, were brought from a distant village in a boat to the Civil Hospital, Myaungmya, with a history of irritant poisoning. The relatives and friends stated that these two young men had eaten a root which was given to them by a young Burmese woman, the wife of one of the men. She herself had eaten several roots, suffered from symptoms of poisoning, and had died on the way to hospital. The men arrived at about 6 a.m., and at 7.30 a.m. the dead body of the woman was received for *post-mortem* examination. The root is said to have been that of *Gloriosa superba* (Burmese si-medauk), a plant which is common in Upper but comparatively rare in Lower Burma. It is a well recognized poison, but is apt to be mistaken by people in Lower Burma, who are not so familiar with it, for the root of the Goa bean (Burmese pe-myit), a potato-like tuber, which is boiled and eaten by Burmans with oil and salt. The woman is said to have eaten several roots; one of the men three roots, each about 2 in. long and 1 in. in diameter, and the other man half a root 3 in. by 1 in. One of the men was unconscious and the other semi-conscious on arrival at hospital. All these persons are said to have eaten the poisonous root at about 3 p.m. on September 7. At about midnight there were signs and symptoms of poisoning, and were briefly as follows: Tingling and then numbness in the lips, tongue and throat; burning

pain in the stomach; numbness in the skin in various parts of the body; intense nausea followed by vomiting, diarrhœa with blood-stained motions; giddiness with loss of power in the limbs; heaviness of eyelids; photophobia; convulsions; loss of consciousness; difficulty of breathing and, when admitted, the pulse of the two men was feeble and quick, with cold perspiration on the body. The patients were given an emetic of zinc sulphate, which acted satisfactorily. They were then stimulated with brandy and given a hypodermic injection of strychnine. They were discharged cured on September 13.

The *post-mortem* examination of the woman revealed severe congestion of the mucous membrane of the stomach, which contained undigested rice and lumps of the boiled root. There was also congestion of the lungs, liver and the broad ligaments of the uterus. The stomach and its contents, the upper part of the small intestine, liver, spleen and kidney were sent to the chemical examiner, who reported that an alkaloid similar in physiological reaction to aconite was extracted from these and from a sample root obtained by me from the jungle here.

In Lyon's "Medical Jurisprudence for India," third edition, 1904, p. 514, it is stated that large doses of the root of *Gloriosa superba* appear to be poisonous, acting in the same manner as squill, and that Warden has recently isolated a bitter principle from the root, which he has named superbine, and considers to be closely allied to, if not identical with, scillitin. On the same page it is stated that scillitin, apparently a glucoside, is the active principle of squill. In the "National Standard Dispensatory," by Hare, Caspari and Rusby, as in other standard text-books on Materia Medica, scillin, scillipicrin and scillitoxin are given as the active principles of squill, but no mention is made of scillitin. This, however, is a matter of little or no importance, but it appears to me that the root of *Gloriosa superba* acts not in the same manner as squill, but like aconite. The signs and symptoms of squill and aconite poisoning are very similar, but there are important differences. With the former there is no tingling, formication or numbness of the lips, tongue, throat or skin, whereas these are marked features in poisoning with the latter. Stranguary and bloody urine occur with squill poisoning, but not in that with aconite. The patients under observation passed urine without any difficulty, and there was no *post-mortem* evidence, in the case of the woman, of irritation of the kidneys or bladder.

According to Moidin Sheriff, native practitioners say that the root of *Gloriosa superba* possesses nearly the same properties as the root of *Aconitum ferox*, hence its name of country or wild aconite. It is interesting in this connection to read on p. 617 of Lyon's "Medical Jurisprudence" that the Burmese, during their retreat before the British in 1842, threw bruised aconite root into a tank, in the hope of poisoning the troops pursuing them. Was this the root of *Gloriosa superba*, which grows luxuriantly in Upper Burma and is well known as a poison?

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THE JOURNAL OF

Tropical Medicine and Hygiene

APRIL 1, 1912.

ANNALS OF TROPICAL SANITATION.

A NEW publication, entitled "Annals of Tropical Sanitation" will shortly be issued by the Liverpool School of Tropical Medicine. The editor is Professor Major Sir Ronald Ross, K.C.B., F.R.S., D.P.H., and he is to be assisted in the editorial work by Colonel W. G. King, C.I.E., D.P.H., and Professor W. T. Simpson, C.M.G., M.D. The volume will contain at least 500 pages, and it is intended to bring it out in four separate sections during the year. The editorial staff is so strong that we look forward with the greatest interest to the publication, and feel sure that the information it is intended to supply will be welcomed.

The work of sanitation in the Tropics has scarcely been begun; here and there efforts are being made, but we hope to see a general scheme promulgated which can be put into execution and practically applied. It is hoped, whilst the scientific work is not neglected, that applied sanitation will be the keynote of the publication. We have a great deal of scientific work in journals devoted to tropical medicine, to well-nigh the exclusion of clinical and practical points of interest. This is to be regretted, for whilst it is necessary to acquire scientific facts

before attempting to apply them therapeutically or practically, the two ought to go hand and hand; for as the ideal practitioner is one who both investigates and practises, so a journal devoted to sanitation should take up the question from the standpoints of both science and practice.

Many tropical men are grumbling that there are too many journals already, that the cost is so great that they cannot afford to take all of them, and wish that they would amalgamate and produce a comprehensive volume including all aspects of tropical work. This will come, no doubt, in the course of time; a great man will arise and blend these journals into one. Meantime, let each develop in its own way. This, the pioneer journal, now in the fourteenth year of its existence, shows no signs of falling off, in spite of new publications. This is a good augury for the newer attempts, and as the Tropics develop, so will the necessity for increased journalistic work grow. There may be some overlapping, but it is a great credit to this country that tropical medicine is receiving the attention it is now doing, and a certain degree of rivalry will do good, so long as each confines itself to the kind of work which called it into being. Sanitation is, perhaps, the greatest necessity for the Tropics, and a journal specially devoted to this subject will help the authorities in charge of our Colonies in their endeavours. Until recently sanitary works were carried out in a perfunctory way. Our only knowledge of, for instance, drainage was gathered from that practised in Great Britain, and it was thought that the drainage schemes suitable for Britain would be equally satisfactory in tropical countries. We know now that this is a fallacy. The system of carrying off surplus water applicable to a temperate climate is found wholly unsatisfactory when the torrential rains of tropical wet seasons have to be dealt with; the long spells of dry weather in many sub-tropical countries bring about a condition of affairs which cannot be managed on the principles of drainage applicable in a temperate climate, where rain is never long deferred.

Other factors conduce to show the impossibility of a sanitary engineer accustomed to work in Britain attempting to recommend what should be done in the Tropics. Many Crown Colonies adopted the system of bringing out a sanitary expert from Britain to put their drainage and sanitation on a better footing. Most of these have had reason to repent their decisions, but only after much money had been spent, and failure to improve the hygiene of the town or district became evident. The disposal of excretory matters also is a subject fraught with pitfalls for home-trained sanitary engineers. The requirements of a village in India or Nigeria are as distinct from those required in England as is light from darkness. There are, moreover, no county councils to be bled in Cathay or Kaffraria; the authorities are not willing to pay for experiments in modern sanitary methods, which, rightly or wrongly, they consider unsuited to the people under their control. In tropical sanitation local conditions have to be studied, customs and religious prejudices have to be seriously considered and handled, expense has to be tempered to the possibilities of the community, and, above all, the people have to be educated to understand the nature and meaning of the work proposed and their consent and co-operation obtained; otherwise disturbances will result which will lead to postponement of improvements, or altogether annul their adoption for an indefinite period. Education of the children in schools in sanitary matters has been begun in several places in the Tropics. The results of this teaching are not, and cannot yet be, evident, but as the children grow to adult years their voices will be heard and undoubted benefits are certain. The new publication would do well to remember this phase of work, and to put before teachers in schools concise information adaptable to the teaching of children. The Editors of the "Annals of Tropical Sanitation" have a great opportunity, and no men in the Empire are better suited for the work in hand than the three experts whose names appear as about to undertake the direction of this great attempt. We wish the publication all success, and believe that a great success will be its portion.

Public Health and Marine-Hospital Service of the United States—"Public Health Bulletin," No. 47, September, 1911.

Specific Therapy in Leprosy.—Currie, Clegg and Hollmann publish their attempts at a specific therapy in leprosy They conclude:—

(1) That vaccine (ordinary suspended killed cultures of *Bacilli lepræ*) cannot be advantageously employed in the treatment of leprosy unless very small doses are used, owing to the slow absorption of the material and its tendency to cause abscesses.

(2) Live cultures of *B. lepræ*, while they have produced no beneficial results in the authors' hands, are deserving of further trial. Small doses should be used to avoid abscess formation.

(3) Toxines prepared from *B. lepræ* after the method of Koch's "old tuberculin" and his "B. E." appear to be of little or no value in the treatment of leprosy.

(4) The extract consisting of fatty material, obtained from lepra bacilli has not been employed for a sufficient length of time to determine whether it is of value in the treatment of leprosy.

(5) The serum of a horse, which animal had received injections of lepra bacilli, has been without any beneficial results to patients suffering from leprosy during the short period the authors have used it; but from the fact that the animal's serum strongly agglutinates *B. lepræ* cultures, the authors are not without hope of increasing the potency of their serum to a point where it may be of benefit in the treatment of the disease.

"British Medical Journal," March 2, 1912.

Oxyuris Vermicularis in Appendix.—Macdonald reports an interesting case of a woman, aged 34, who was admitted into Scarborough Hospital for appendicitis. At operation the appendix was found to be enlarged and acutely inflamed at its tip. After removal it was split up and the following interesting condition was found: Two distinct collections of *Oxyuris vermicularis* were seen towards the base, whilst at the tip there was a small collection of pus under tension with a small concretion. Animal parasites are from time to time seen in the appendix, the *Trichocephalus dispar* having been reported on several occasions.

Annotations.

The Life-cycle of Spirochætes.—Fantham, in the *Annals of Tropical Medicine and Parasitology* for December, 1911 (Series T.M., vol. v, No. 3), contributes a very interesting paper on "Some Researches on the Life-cycle of Spirochætes."

The spirochætes considered in his paper were *S. duttoni*, *S. recurrentis* and *S. marchouxi* (= *gallinarum*) among blood-inhabiting forms, also *S. balbianii* in *Ostrea edulis* and *Tapes aureus*, *S. anodontæ* in *Anodonta cygnea* and *S. solenis* in *Solenensis*. Both living and stained material were used.

The conclusions Fantham reaches after his study of these forms are as follows:—

(1) True longitudinal division, as well as transverse division has been observed in these spirochætes. There is a periodicity in the division of the blood-inhabiting spirochætes, transverse division occurring when the parasites are numerous in the blood, longitudinal division occurring at the beginning and end of infection.

(2) Transverse division following flexion, or "incurvation," has been observed, but somewhat rarely. Transverse division usually occurs in relatively straight or unflexed forms. The author does not consider that "incurvation" is a necessary preliminary of transverse division.

Intertwined forms have not been mistaken for longitudinal division.

(3) The protoplasmic contents of some of the spirochætes of the blood may break up into a number of small, round, or ovoid bodies, lying loose within the periplast, which ultimately ruptures at one end and sets them free. These minute bodies, variously known as "coccoid bodies," "granules," or "spores," are formed at the crisis. Fantham doubts if these bodies represent an essential phase in the life-history of the spirochætes in the vertebrate host, but are rather an anticipation of the similar phase in the invertebrate hosts of these spirochætes. However, occasionally "granules" may occur inside the red-blood cells.

(4) Certain *S. duttoni*, when ingested by *Ornithodorus moubata*, and certain *S. gallinarum* ingested by *Argas persicus* pass through the intestinal wall of their hosts, and then form minute coccoid bodies, spores, or "granules" by multiple transverse fission. Such granules, as well as spirochætes, may be found in the hæmocœlic fluid of the ticks, in the Malpighian tubules and in the gonads.

(5) Some of the spirochætes and spores reach the ovaries and ova of the infected parent tick. The spores concentrate in the Malpighian tubules of the developing embryo, which may be born infected.

(6) Many nymphs of *O. moubata* born of infected parents are themselves capable of infecting. In the case of nymphs of *Argas persicus*, although various observers have recorded negative results, more experiments are necessary before it can be asserted that nymphs born of infected parents are themselves not infective.

(7) The main source of infection from both adult and young ticks is the white excrement passed from the Malpighian tubules.

(8) Elongation of the coccoid bodies, spores or "granules" to form short rods, and growth of these rods to form longer (or vibrio) forms has been observed in the tick. In this way young spirochætes are developed.

(9) The spirochætes of Lamellibranchs do not necessarily depend on a carrier for change of Lamellibranch host. Cross-infection is brought about by water, which conveys not only active living spirochætes from the alimentary tract and mantle cavity of infected molluses to the inhalent apertures of other molluses, but also coccoid bodies (spores) may be thus conveyed and cross-infect. Coccoid bodies have been observed in process of formation in *S. balbianii* and *S. anodontæ*.

(10) The life-cycle of the spirochætes of Lamellibranchs and of the spirochætes of the blood of vertebrates follows a similar course. Their morphology is much the same, allowing for differences of size. There appears to be no justification for separating generically the spirochætes of Lamellibranchs from their allies in the blood of vertebrates.

Ulcerating Granuloma of the Pudenda.—Steel, in the *Lancet*, of January 27, 1912, writes on ulcerating granuloma as found in the Government Lock Hospitals, Western Australia. His paper gives an excellent summary of our knowledge of this disease at the present time. As regards etiology, staphylococci, streptococci, and bacilli of all kinds with many large spirilla were constantly obtainable, but their causative *rôle* was most indefinite. Cultures on the usual media, agar, blood agar, blood serum, &c., produced no constant results, a great variety of germs being obtainable.

Removal of the superficial layers, with scrapings taken from the deeper portions of the indolent ulcers, where there was not much accompanying thickening of the surrounding parts, gave more definite results. Spirilla of a somewhat large size, resembling *Spirillum refringens*, were occasionally seen. Sometimes with them, sometimes in their absence, spirochætæ identical in their morphological characteristics with *Treponema pallida* were found. As this method was open to the objection that these spirochætæ might be extraneous agents, removal of the ulcers was practised, and smears were made from the deeper tissues occasionally showed the presence of similar organisms, but in what percentage of cases they will ultimately appear as constant factors is not yet certain. A similar spirochæta has been described by Wise, Clelland, and others as occurring in these lesions.

Sometimes another parasite was in evidence, usually in the fungating, granulomatous variety of the infection, and often in the enlarged inguinal glands, when such were present. Generally seen in the large, swollen mononuclear cells, and often in considerable numbers, they possessed varying

appearances; if for any reason they appeared crowded together the bodies resembled enlarged cocci-bacilli, sometimes kidney-shaped, not unlike huge gonococci; but when spread out, or in mononuclear cells, there was the appearance of a differentiation into a rod-shaped nucleus and a surrounding protoplasm.

Dr. Steel believes that we are here dealing with two distinct diseases, or an infection of an already diseased subject with another germ.

Many different treatments were tried in the cure of the disease, latterly salvarsan ("606") being employed. In some cases, according to Dr. Steel, the value of this drug was undoubted, beneficial effects in some very bad cases being apparently instantaneous, and paving the way to a permanent cure when all other measures had failed. Grey oil and calomel given intramuscularly, alone, or in alternate doses, have also been given. Dr. Steel does not lay enough stress on early excision. If the cases are seen early enough this is the method of treatment that should always be adopted. In British Guiana, where this disease is very common, such a procedure has been very successful.

Oriental Sore on the Isthmus of Panama.—Herrick, Chief of the Surgical Clinic, Ancon Hospital, reports a second case of Oriental sore on the Isthmus of Panama, the type of the case being unusual.*

The case Herrick states is of interest on account of its rarity, being the second case identified on the Isthmus, and it presents also one of the more unusual forms of the disease, in which the lesions are multiple. It bears a marked resemblance to skin epitheliomata, the initial lesion being similar to a rodent ulcer, and the later nodules to multiple epitheliomata of the skin.

The patient, Thomas Smith, 53 years old, Jamaican, had lived on the Isthmus twenty-four years. He was admitted from Bohio January 4, 1909, suffering from an ulcer of the right ear and a fairly extensive dermatitis over his body. He had lived at Bohio since 1904, and was employed in the canal work. During the wet season of 1908 he was engaged in one of the survey parties from Gatun to San Pablo. In this work he was frequently wet in wading through swamps and ponds, and to this he ascribes the dermatitis. There was considerable itching associated with the dermatitis, which at this time covered almost his entire body, including his right ear. In alleviating this condition he scratched his right ear until it became sore. This occurred a few months previous to admission, but during this period he had no fever and was in perfect health. The sore on the ear produced by the scratching gradually extended, and when he was admitted to the hospital it presented an ulcer which involved the entire margin or helix of the ear, extending to the depth of the fossa of the helix. The margins of the ulcer were slightly indurated and the base had a granular appearance. There was a low grade generalized dermatitis or dhobie itch affecting mainly the abdomen and groins. The general physical examination was negative.

The ulcer of the ear was excised and referred to the pathologist for diagnosis, his report being as follows:—

"Extensive ulceration, and the entire corium infiltrated by round and oval cells and occasionally giant cells. Papillæ frequently missing or flattened out with numerous prolongations into the corium."

When the patient left the hospital, the wound having healed, there were six small lumps the size of a pea scattered in the skin over his body. These gradually increased in size and caused his return on July 27, 1909, at which time they presented indurated and ulcerated patches varying in size from 2 to 5 cm. The right ear likewise showed a recurrence of the ulcerative process, which had extended from the margins and involved almost the entire ear. All the lesions were excised and the base of each place cauterized. The wounds slowly healed by granulation, and he was discharged well in November, 1909.

Three months later a ringworm developed on his chin, and he noticed small lumps on his left shoulder, left forearm, and left ankle. These increased in size, and he returned to the hospital August 30, 1910, with an ulcer on his chin almost an inch in diameter. He also had lesions about the same size on his left shoulder and about the size of the palm of the hand on his left knee and left ankle. These were excised September 2, 1910, and the bases of all the surfaces cauterized.

These specimens were examined by Dr. Darling, chief of the laboratory, and he discovered *Leishmania tropica* in the bases of the ulcers. Three weeks later, after the formation of healthy granulations, an examination was made for the presence of *L. tropica*, but no organisms were found. An enlarged and tender inguinal gland was excised, but no organisms were found in it.

This case, as Herrick says, illustrates the extreme chronicity of the process, as the original sore began two years ago in the fall of 1908. It also shows that the sores are infectious, for the secondary lesions were undoubtedly transmitted by his scratching the areas of dermatitis. The last group of lesions may have arisen in the same manner. Whether the initial lesion was due to the bite of a fly or to some other chance infection, it is impossible to say. This case also illustrates the marked resemblance to epitheliomata, the infiltrated skin presenting the appearance of an epithelial tumor, and the ulcer of the ear a rodent ulcer. The pathologists were in doubt when examining the first specimen as to whether it was a true epithelioma, and it was not until the second specimens were examined that *L. tropica* was found.

* Isthmian Canal Commission, Sanitary Department. *Proceedings of the Canal Zone Medical Association* for the half year, October, 1910, to March, 1911, vol. iii, part 2. I.C.C. Press, Quartermaster's Department, Mount Hope, C. Z.

Murrina, a New Trypanosome Disease.—Darling, at the fifty-seventh meeting of the Canal Zone Medical Association, December 7, 1910,* read a very interesting paper, entitled "Murrina, a Trypanosomal Disease of Equines in Panama."

He said that there had been an epidemic of trypanosomiasis among American mules and work-horses in the Canal Zone. The disease resembled other trypanosomal diseases, such as nagana, surra, mal de caderas, and Senegambian horse disease; but it presented a group of symptoms and pathological features which stamped it as a distinct disease.

The disease could be differentiated from mal de caderas by the morphological characters of the trypanosome, the autopsy picture, and the clinical features of the disease.

The disease also resembled in some particulars "swamp fever," or the "infectious anæmia of equines," a disease of obscure etiology, prevalent in some parts of the Western United States.

The disease was probably not introduced from outside sources, but represented an endemic disease of this region, known in the Republic of Panama as murrina and derrengadera.

It was distinctly a disease of mules and horses, for cattle were insusceptible. The pathogenic agent, *T. hippicum*, had morphological and biological characters which differentiated it from other species of trypanosomes, and the animal reactions of several of the native mammals, including domestic animals, had been determined.

The chief distinguishing features of the disease were: Anæmia; weakness; emaciation and œdema; conjunctival ecchymoses; conjunctivitis; pyrexia; and some posterior paresis. The pathological findings were constant and characteristic: Splenic capsular ecchymoses; acute hæmorrhagic nephritis, with acute glomerulitis and petechiæ; hæmorrhages in renal lymph nodes; epicardial and endocardial ecchymoses, and less constantly pleural, peritoneal, and conjunctival ecchymoses, and pleural effusion. The blood changes were those of anæmia with lymphocytosis, and there was much phagocytosis of blood pigment by endothelial cells of the liver and spleen.

The disease, Darling believes, is probably transmitted mechanically by flies through the broken skin of cuts and various wounds. Saddle horses were not infected, and there were no evidences that any animals were infected by means of stomoxys or tabanids or by ticks or bats.

Darling further states that the epidemic, which threatened to destroy several hundred mules and horses, had been controlled (there having been no new case in six months) by detection of infected animals, by means of daily routine temperature records throughout the corral, the microscopic examination of the blood of all animals having a temperature above 100° F., the isolation in screened stables of infected animals or suspects, and the sacrifice of all infected animals.

* Isthmian Canal Commission, Sanitary Department. *Proceedings of the Canal Zone Medical Association* for the half year, October, 1910, to March, 1911, vol. iii, part 2. I.C.C. Press, Quartermaster's Department, Mount Hope, C. Z.

A Case of Cysticercus Cellulosæ.—Krishnaswami, in the *Indian Medical Gazette* for January, 1912, publishes an interesting case of *Cysticercus cellulosæ* infection. The patient, a low-caste South Indian Hindu, was admitted into the General Hospital, Rangoon, for weakness of the lower extremities. On admission he was seen to be a well-nourished man about 35 years old. He could both stand and walk, but complained of being very quickly tired and that his legs were painful after slight exertion. Sensation was normal in the lower limbs. Knee-jerks could not be obtained. Muscular power fair: his intelligence was that normal to a man of his description. With the exception of disease of both eyes and the muscular condition to be described his organs appeared to be healthy, both eyes were blind, the left from the effects of an injury four years before, the right from recent extensive corneal ulceration. Scattered all over the body but more particularly in the muscles of the calves were numerous hard, slightly painful nodules about the size of small beans: fifty-six were counted by the Sub-Assistant Surgeon in charge of the ward. There were no nodules under the tongue and the nodules were larger than those usual in trichinelliasis. A nodule was excised for microscopic examination, and within it a scolex of *Tænia solium* was easily detected. An examination of the stools was made but tænia ova were not found. The patient being blind remained in hospital, but beyond the fact that he was not capable of very active exertion, there were no signs of real illness. He ate and slept well and took an active part in most of the petty ward quarrels. In November he fell sick with an attack of lobar pneumonia and died.

Dr. Krishnaswami found the following lesions on *post-mortem* examination.

The right lung was the seat of lobar pneumonia of the lower lobe: at the apex of this lung were one or two small cavities lined with fibrous tissue. These may have been the remains of cysticercus cysts, but there were no scolices. The left lung was normal. In the heart were numerous cysts, situated both superficially beneath the pericardium and also deeply embedded in the muscle substance. The majority of these cysts contained scolices. Apart from the presence of these cysts the heart appeared healthy. The abdominal organs with the exception of the pancreas were healthy. The pancreas was large and hard and covered with numerous areas of fat necrosis, while similar areas were present in the fat of the neighbouring omentum and mesentery. Within the substance of the pancreas were a fair number of cysts. The gall-bladder contained a few small biliary calculi. The brain was studded with cysticercus cysts. Thirty-three were counted just beneath the pia mater upon the right

cerebral hemisphere and in the deeper parts of the brain they appeared to be equally numerous.

Scattered throughout all the voluntary muscles examined, cysts were found in great abundance. In the specimens of the right calf muscles—dissected and kept as a museum specimen—twenty-six could be counted. No cysts were found in the eyeballs.

The case is of interest in showing what an enormous number of these cysts may be present with practically no clinical signs as a result.

Vital Blood-staining.—Balfour, in the *British Medical Journal*, of February 17, 1912, contributes a preliminary note on "The Value of Vital Blood-staining in the Study of the So-called Infective Granule." In the fourth report of the Wellcome Tropical Research Laboratories, Khartoum, and elsewhere, the author states how valuable the dark-field method of blood examination in studying the extrusion of living granules from spirochætes and trypanosomes is. By this method, combined with the better known laboratory processes, he had been able to discover a good deal regarding the part played by the infective granule in Sudan spirochætosis, both in the blood and organs of the fowl and in the fluids and tissues of the ticks which served as vectors of the disease. At the same time certain gaps in our knowledge remained to be bridged, and it was with the object of discovering, if possible, the missing links, that he decided to see if vital staining of the blood, a method commonly employed by German hæmatologists for studying the morphology of blood-cells, would be of service.

After various trials it was found that toluidin -blue was the best stain to employ, and the most suitable strength proved to be one of 0.05 per cent. The solvent used was normal salt solution. The technique was of the simplest—the fresh blood and staining solution being mixed in a Wright's pipette and a drop of the mixture mounted as a sealed cover-slip preparation. The method appeared to have solved many difficulties. It frequently showed up the granules in the living spirochætes, it stained the free and living granules, it had apparently enabled the penetration of the red cell by the granule to be witnessed, and it had shown that not only were granules (spore forms) discharged from the mature intracorpuscular bodies, but that these bodies, unruptured and still containing the spores (merozoites), could be themselves set free from the red cells. Incidentally it had shown that they possessed capsules or limiting membranes. Further, and of the greatest importance, it would seem to have permitted the demonstration of the development of the young spirochæte from the granule in the peripheral blood.

So far as the blood was concerned, one great advantage of its use was that hæmoconia remain unstained, and thus a very disturbing factor in dark-field work was easily eliminated.

Dr. Balfour hopes that the publication of this preliminary note may induce those who are working at this granule problem to give the method of vital staining a trial, as it is important to collect all available evidence regarding a phenomenon which he believes to be of very great importance and significance. He thinks it might prove specially valuable in the study of what he has called "cryptic trypanosomiasis," a term which Dr. Bagshawe has adopted.

It will be well to remember, however, that there are many fallacies to be encountered in this vital staining method. It was by such a method, using methylene-blue as his stain, that Braddon was led to the belief that stain inclusions in the red corpuscles were a new form of malarial parasite. It will have to be shown that the apparent penetration of the red cells by the granules mentioned above is not a phenomenon of a similar nature therefore.

Reports on Plague Investigations in India.—In the *Journal of Hygiene—Plague Supplement I—the Sixth Report on Plague Investigations in India*, amongst other interesting details are contained a paper on "Observations on Plague in Eastern Bengal and Assam." The origin of this paper was as follows:—

The Sanitary Commissioner with the Government of Eastern Bengal and Assam addressed the following letter to the Sanitary Commissioner with the Government of India:—

"It has been suggested that an addition to our knowledge of plague might be gained by a study of the conditions under which the people of this Province are living, seeing that they have not hitherto suffered from the disease in an indigenous form, and I have the honour to ask whether the members of the Plague Commission could make it convenient to extend their researches in this direction. I may add that the Local Government would be glad to welcome them and to afford them assistance in their work."

In compliance with this invitation the Advisory Committee arranged that the Commission working in India should make an inquiry in the Province of Eastern Bengal and Assam. This inquiry was started in December, 1909, and the results are given in the following conclusions:—

(1) The Province of Eastern Bengal and Assam has suffered very little from bubonic plague; a few epidemics only of pneumonic plague have occurred.

(2) The physical features of the country protect it to some extent from the importation of infection, and would tend to limit the opportunities for spreading the disease if it once broke out.

(3) The freedom of the Province from plague can chiefly be attributed to the scarcity of rats in the houses as compared with other parts of India.

(4) *Mus rattus* is comparatively rare in Bengali houses because of the habits of these people in respect to their greater regard for neatness and

tidiness both in and around their dwellings, which diminishes the food supply of the rodents.

(5) The structure and design of the Bengali home, whether it be of the solid masonry type on the one hand or of the flimsy matting or grass type on the other, afford little shelter for rats.

(6) The presence of natural enemies of *M. rattus*, such as the musk rat, may assist in maintaining a low rat infestation of the houses.

Abstract.

A CASE OF AMŒBIC DYSENTERY OCCURRING IN A MAN WHO HAD NEVER BEEN OUT OF SCOTLAND.*

By Major D. G. Marshall, I.M.S.

Lecturer on Tropical Diseases in the University of Edinburgh.

Major Marshall believes that this case appears worthy of record for several reasons, but chiefly because it is the first case originating in Great Britain diagnosed during life. A similar case, complicated by abscess of the liver, in a man who had never been out of England, occurred a few years ago in Birmingham, and was reported by Saundby and Miller. Unfortunately the condition was not recognized during life, its true nature only being revealed at the *post-mortem* examination.

Amœbic or, as it is sometimes erroneously termed, tropical dysentery is not confined to tropical or subtropical countries, but occurs in temperate climates; for example, in North America and in Europe. Until recently it was stated that Great Britain, Scandinavia, Spain, and Portugal were the only European countries from which cases of the disease had not been reported.

Until the Birmingham case was published the disease had not been reported in Great Britain, though there is little room for doubt that cases which remained unrecognized have occurred in the past. It is hoped that the description of this case, with the methods employed for the detection of the entamœbæ in the stools, may prove helpful to medical men at home, and possibly lead to the detection of other cases.

How did the patient become infected? As will be seen from the appended notes of the case, he was a ploughman who had never been out of Scotland. As a result of a thorough investigation of his home surroundings, in which Major Marshall was greatly assisted by Drs. Macdonald and Maclagan, of Dunbar, under whose care the patient had previously been, some interesting facts were elicited.

A few weeks before the patient was taken ill a woman on an adjacent farm had suffered from somewhat similar symptoms. She had, however, recovered in the course of a fortnight, and the case was apparently one of simple colitis. Nevertheless, to make sure of the diagnosis, her stools were examined, and neither amœbæ nor spores were found.

The question whether persons apparently in good health may be "carriers" of pathogenic amœbæ has been often discussed. On further inquiry it was found that towards the end of 1910 a time-expired soldier had returned from India, and lived in a cottage adjacent to the one occupied by the patient. The soldier had not suffered from dysentery, but stated that many men of his regiment had been in hospital with the disease at Bangalore.

The stools of this man on examination revealed the presence of fairly numerous spores, but whether they were the spores of *Entamœba histolytica* could not be determined by mere microscopic examination. Portions of the stools were daily administered, with its food, to a cat for a fortnight. Up to the present the cat has not developed any symptoms.

On inquiry into the water supply, it was found that during the drought of last summer the ordinary supply conveyed by pipes from the Lammermoors had given out, and consequently the patient had been accustomed to obtain his drinking water from a pipe fed by a "surface" spring in a stackyard. The water from this spring had formerly been greatly prized by the farm servants, but they had temporarily ceased using it on account of contamination from a midden.

Hay infusion is considered a good medium for the growth of amœbæ. It was found that on the East Lothian farms, as in other agricultural districts, the men do not use privies, but are accustomed to defæcate in any place outside which may appear suitable to them. It is therefore not improbable that the returned soldier, supposing that he was a "carrier" of amœbæ, had contaminated the source of the spring, and that at the onset of the hot weather of last summer the amœbæ found the water of the stackyard to be a suitable medium for development.

It is reassuring to know that the pathogenic amœbæ, including the *Entamœba histolytica*, will only flourish in association with high atmospheric temperature, the requisite minimum being 75° F. There is no doubt pathogenic amœbæ are often imported into this country by dysentery patients returning from abroad, but it is only under exceptional climatic conditions, such as obtained last summer, that they are likely to cause fresh infections.

Another possible but improbable solution of the question would be that harmless amœbæ, so common in the intestinal canal of healthy persons, may under certain conditions assume pathogenic functions.

Case.—T. P., aged 28, a ploughman, residing near Dunbar, was admitted to Ward 34 of the Royal Infirmary, Edinburgh, on November 19, 1911, suffering from chronic diarrhœa.

* A paper published in the *Edinburgh Medical Journal*. March, 1912.

History.—About seven weeks before admission the patient began to suffer from diarrhœa, the stools being of a very watery character and numbering three or four a day; the diarrhœa commenced suddenly one morning, the patient having been perfectly well the previous day. The stools for the first week did not contain blood, and defæcation was unaccompanied by pain during the first fortnight; later the stools became "slimy," and contained whitish specks like pieces of mutton fat. As the disease progressed the stools became more numerous. They were slimy as before, and contained blood and whitish masses, evidently portions of mucous membrane. The patient stated that about a fortnight before admission he was free from diarrhœa for two days, and did not pass any blood during that time.

Previous Health and Social Conditions.—He had never had any serious illnesses. His parents, two brothers, and four sisters are alive and well. He had never been out of Scotland.

Physical Examination.—The patient, though somewhat anæmic, was a well-developed muscular man. Nothing abnormal could be found except in the digestive system.

Digestive System.—Continual uneasiness over the lower part of the abdomen, with severe griping and bearing-down pains before and directly after defæcation. Stools watery and of a reddish colour owing to admixture with blood; they contained white specks and shreds of mucous membrane with numerous amœbæ. Tongue moist and clean. Abdomen, nothing abnormal on inspection; on palpation pain on pressure over the region of the colon. Nothing abnormal to be found on rectal examination. Liver not enlarged; no jaundice.

Blood and Temperature Chart.—In the early stages of amœbic dysentery there is often irregular fever, and the blood shows a moderate leucocytosis of 16,000-18,000 per c.mm.

In the present case, while in hospital, the temperature was only above normal on one day, and the blood throughout did not give a higher count of leucocytes than 8,200 per c.mm.

Progress.—The patient while in the wards presented the usual typical symptoms of amœbic dysentery, especially the tendency to relapse when the condition had much improved. Under treatment with large doses of ipecacuanha he had by the end of December, 1911, improved so much that he was allowed up. He was at this time passing one semi-solid stool a day. In a few days, however, the condition became as bad as before, the stools numbering six or seven a day, and containing large quantities of blood. In the course of a week under ipecacuanha and rectal injections of quinine the stools were diminished in number and free from blood. On February 10, 1912, he was almost convalescent, passing only one stool *per diem*, and was rapidly regaining strength.

During the last ten days amœbæ could not be found in the stools.

Diagnosis.—While the symptoms may be of help, detection of the amœbæ in the stool is the only certain method of diagnosis in this disease. In old-standing cases which have passed into the spore-forming stage examination of the stools is often inconclusive, and it is then necessary to carry out feeding experiments on animals.

Method of Examination of Stools.—Only the liquid part of the stools should be examined. Therefore, if the patient is passing solid stools a saline purgative should be administered prior to the examination. Both unstained and stained films should be examined.

If it is desired to observe the movements of the amœbæ, the stools should be passed into a warm bed-pan and, without being allowed to become cold, examined on a warm stage. In any case, the examination should be carried out as soon as possible. If a stool is allowed to stand for a day or two, the amœbæ become disintegrated and absorbed; in fact, it is sometimes difficult to find them in a specimen which twelve hours previously showed them to be present in great numbers.

For detection in an unstained specimen it is simply necessary to take up a small portion of the stool on a platinum wire, spread this on a slide, and, after putting on a cover-glass, apply gentle pressure to spread out the film in a thin layer. It must be borne in mind that in examining unstained specimens it is essential to *cut off the light as much as possible;* neglect of this precaution often greatly increases the difficulty of examination.

On examination with a $\frac{1}{3}$-in. objective, if the stool has been allowed to cool and the amœbæ are dead, small round refractile bodies (closely resembling in appearance oil globules) will be seen in the darkened field. With higher powers these will be found to present a well-defined outline; the interior appears granular, and may show a faint nucleus and, possibly, both red corpuscles and leucocytes.

Stained Specimens.—Disappointing results are often obtained by the use of inappropriate methods of staining the film.

The best stain for diagnosis is thionin blue. The film may be allowed to dry, or fixed while still wet with osmic acid (and then treated with a saturated solution of corrosive sublimate) or with formalin (40 per cent.) 1 part, methylated spirit 9 parts. Allow the stain to act for ten to fifteen minutes, wash in water, clear with 2 per cent. acetic acid in water for a second or two, pass through alcohol and xylol, and mount in neutral Canada balsam or paroleine.

Numerous amœbæ of different sizes and shapes were seen. They varied in size from 10 to 50 μ, and showed the characteristics of the *Entamœba histolytica*, which are as follows: (1) The amœba is large, the outline well defined, due to the presence of a distinct ectosarc; (2) the nucleus is eccentric and stains faintly; (3) contents include red and white blood corpuscles and bacteria.

A disadvantage attending the use of thionin blue is the tendency of the specimens to fade. Heiden-

hain's iron hæmatoxylin not only gives more permanent results, but is useful in studying the nuclear elements.

Although the symptoms and the amœbæ found in the stools were typical, it was considered advisable to make cultivations from the stools to ascertain whether any bacilli of the Flexner group were present. This was done with a negative result.

Cultivation of Entamœbæ.

Many people have claimed success in the cultivation of pathogenic amœbæ.

Craig says: "The entire subject of the cultivation of the parasitic amœbæ of man is in a chaotic condition, and much more work will have to be done before it can be accepted that any of the parasitic amœbæ of man have been cultivated." Greig, as a result of the special inquiry on which he had been engaged on dysentery and liver abscess in Bombay, states that "the specific identity of the amœbæ in fresh stools and those in cultures was not clearly established, and the interpretation of the results of cultivations presents peculiar difficulties."

Many attempts were made to cultivate the amœba present in this case on Musgrave and Clegg's medium in combination with various symbiotic bacteria, but they were invariably unsuccessful.

Experiments on cats were carried out as follows:—

(1) Regular feeding with stool of the suspected "carrier."

(2) Feeding with stool of patient which microscopically showed spores and a few amœbæ.

(3) Injection into the lower end of the small intestine of a cat of 10 c.c. of liquid of 2. Sufficient time has not yet elapsed for an opinion to be formed as to the results of these experiments.

Treatment.

Although the treatment by salines affords satisfactory results in bacilliary dysentery, there is no doubt that in the amœbic form the best treatment consists in the administration of powdered ipecacuanha in 20 to 30 gr. doses, combined with the use of solution of quinine for lavage of the colon.

Abscess of the liver is less likely to occur if ipecacuanha has been freely administered.

There are various methods of administering these large doses of ipecacuanha, all being, of course, devoted to the prevention of vomiting.

Whatever method is employed, it is essential that when the dose is administered the stomach should be as nearly empty as possible, and that afterwards the patient be kept perfectly quiet in bed.

In places where the assistance of a skilled pharmacist is not available, as in most tropical countries, the drug has generally to be administered in the form of a pill or suspended in some bland fluid, the patient being prepared by cutting off food and drink for two or three hours previously, with a good dose of opium or chloral half an hour before giving the ipecacuanha; it is also advisable to apply a sinapism over the epigastrium to assist in preventing vomiting.

Another method consists in making up ipecacuanha in pills, coated with some material which will resist the action of the gastric juices and dissolve in the small intestine. Salol and keratin have been recommended for this purpose. Personally I have had the most satisfactory results from the use of gelatine with the addition of a small quantity of formalin as a coating. It is absolutely necessary that the pills should be freshly and skilfully coated. If kept for a few days, or if an excessive amount of formalin is used, they are apt to become hard and insoluble, and are passed unchanged through the intestine.

It is well to diminish the dose of ipecacuanha after two days and discontinue it for a while at the end of ten days. The administration should be recommended if any exacerbation of the symptoms develop.

Reports.

THE SOCIETY OF TROPICAL MEDICINE AND HYGIENE.

At an ordinary meeting of the Society of Tropical Medicine and Hygiene, held at the Laboratories of the Royal Army Medical College, Grosvenor Road, London, S.W., on Friday, March 15, 1912, at 8.30 p.m., the evening was devoted to the demonstration of microscopic and other preparations of interest. Among other exhibits the following specimens were shown:—

(1) A Rapid Method of Diagnosing the Presence of Malarial Parasites. By Dr. John Cropper.

(2) Parasites from Oriental Sore. By Dr. Donald W. Carr, Ispahan.

(3) *Schistosomum japonicum*. By Fleet-Surgeon Bassett Smith, C.B.

(4) Various Blood Parasites. By Dr. T. S. Kerr.

(5) Development of *Filaria immitis* in Mosquitoes. By Dr. G. C. Low.

(6) *Entamœba histolytica*. By Dr. Carnegie Brown.

(7) A series of microscopical and other specimens, illustrating kala azar, tick fever, malaria, ankylostomiasis, &c. By Lieut.Colonel Sir William Leishman, Lieut.-Colonel W. S. Harrison, Major J. L. Cummins, Captain J. C. Kennedy, and other officers of the Royal Army Medical Corps.

(8) Specimens of Amœbæ from a Case of Amœbiasis in a Man who had never been out of Scotland. By Major Marshall, I.M.S., of Scotland.

At the same meeting the following gentlemen were elected as Fellows of the Society: Phineas S. Abraham, M.D., 66, Harley Street, London, W.; Captain Leonard Bousfield, M.D., R.A.M.C., London; Lieut. G. Rigby Lynn, M.B., I.M.S.,

Bombay; Captain W. R. O'Farrell, L.R.C.P., R.A.M.C., Khartoum; Captain S. MacKenzie Saunders, M.R.C.S., R.A.M.C., Khartoum; Captain A. B. Smallman, M.B., R.A.M.C., London; Captain D. P. Watson, M.B., R.A.M.C., London.

MEDICAL REPORT FOR BASUTOLAND FOR THE YEAR 1910.

By Edward C. Long,
Principal Medical Officer.

Leprosy is still increasing and a count of lepers made during the year showed that there are at least 700 cases scattered about the country. At any rate, we have that number recorded in our registers and there are probably a few who have evaded registration.

The question of the formation of a leper settlement has been under consideration, and it is hoped during the ensuing year to accomplish something in this direction. I am glad to say that native public opinion is favourably disposed towards some scheme for the isolation of lepers. In a native territory like Basutoland, we could not hope to maintain successfully a leper settlement without the co-operation of the people. With such co-operation the difficulties would be small and the possibilities of establishing a leper settlement would be governed mainly by the question of expense.

Some investigations into the cause of the spread of leprosy have been made by the writer. A short paper embodying the result of these investigations to date is attached to this report. Experiments are still in progress and a few lepers are maintained in tents on the Maseru Reserve for experimental purposes.

Review.

On Gastroscopy and Œsophago-Gastroscopy. By William Hill, M.D. John Bale, Sons and Danielsson, Ltd., Oxford House, 83-91, Great Titchfield Street, Oxford Street, London, W. 1912. Pp. 46, with 47 illustrations. Price 3s. 6d. net.

Dr. Hill has greatly advanced our knowledge of gastroscopy and brought the subject within the sphere of practical application in medicine. He has shown that the stomach is readily accessible to endoscopic examination, and can be usually explored as efficiently and safely as can the bladder by cystoscopy. Viewing the stomach by direct and indirect (*i.e.*, periscopic) methods has been in vogue for many years, and by a gradual process of evolution we have attained something like precision in the subject. Dr. Hill has succeeded in producing an apparatus whereby the direct and indirect methods of examining the stomach and gullet are combined. The technique of application is carefully given in this book, the dangers pointed out and the methods of overcoming them dealt with. There can be no doubt that endoscopic examination on the lines and by the apparatus advocated by Dr. Hill will afford a valuable means of clearing up many gastric lesions which have long puzzled clinicians and defied ordinary methods of treatment. The illustrations are excellent, and the book is written in a style which is at once convincing and teaching.

Personal Notes.

Colonial Medical Services.

West African Medical Staff.

No deaths.

No resignations.

Transfers.—P. C. Conran, M.R.C.S.Eng., L.R.C.P.Lond., Medical Officer, Northern Nigeria, has been transferred to the Nyasaland Protectorate; E. Langley Hunt, L.R.C.S., L.R.C.P.Ireland, Medical Officer, Gold Coast, has been appointed an Itinerating Inspecting Officer in the Medical Department of Ceylon.

New appointments.—The following gentlemen have been selected for appointment to the Staff:—C. L. Ievers, L.R.C.S., L.R.C.P.Edin., L.F P.S.Glas., Gold Coast; R. Semple, M.B., Ch.B.Aberdeen, Sierra Leone.

Other Colonies and Protectorates.

F. R. Sayers, M.D., B.Ch., B.A.O., D.P.H.Dublin, to be House Surgeon, Straits Settlements; D. C. Macaskill, M.B., Ch.B.Edin., to be Medical Officer (Grade III), Federated Malay States.

India Office.

From February 17 to March 16.

Arrivals reported in London.—Lieutenant-Colonel K. Prasad, I.M.S., B.; Captain A. Whitmore, I.M.S., B.; Captain R. L. Gamlen, I.M.S.

Extensions of Leave.—Major S. Evans, I.M.S., Bo., 11 days; Lieutenant-Colonel J. J. Pratt, I.M.S., B., 6 m., M.C.; Major T. H. Foulkes, I.M.S., M., 1 m.; Captain C. E. Bulteel, I.M.S., 6 m., M.C.; Colonel R. W. S. Lyons, I.M.S., to May 20, 1912.

Permitted to Return.—Captain J. M. Holmes, I.M.S.

List of Indian Civil Officers on Leave (including Military Officers under Civil Rules).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Hunter, Major G. Y. C., I.M.S., B. Gaols, 18 m., March 30, 1911.

Sykes, Lieutenant-Colonel W.A., D.S.O., I.M.S., Beloochistan, 19 m. 1 d., December 16, 1910.

Prasad, Lieutenant-Colonel K., I.M.S., Burma, 12 m., Nov. 23, 1911.

List of Indian Military Officers on Leave.

Showing the Name, Regiment, or Department, and the Period for which the Leave was granted.

Babington, Captain J. W. H., I.M.S., 1 y., from September 5, 1911.

Norman, Lieutenant V. P., I.M.S., 6 m., from November 15, 1911.

Russell, Captain A. J. H., I.M.S., 5 m. 9 d.

Sarkies, Lieutenant-Colonel C. J., I.M.S., 11 m. 11 d., from January 9, 1912.

Thompson, Captain F. T., I.M.S., 6 m., from December 16, 1911.

Whitamore, Captain V. N., I M.S., 1 y., from May 5, 1911.

Correspondence.

To the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

GENTLEMEN,—The second number of the current volume of your JOURNAL contains an article on the "Weights of Organs in Different Races," by Lieutenant-Colonel R. H. Castor, and Doctors Wadell and Haran, which is of special interest to anthropologists. The want of precise data of this nature has long been felt in this branch of science.

May I point out, however, two facts which somewhat mar the value of these determinations. The first is the recording of the data in pounds and ounces. In both anthropology and anatomy it is habitual to deal with the metric measures and weights, and the giving of data of this nature in grammes would save much work in converting the English to the metric weights.

The second point is much more important. It is the necessity of recording with all such data the stature of the individual. The head, the brain, and, in all probability, many, if not all, of the other organs bear in general a certain relation to the height of the body, and if data on the latter are wanting, it is quite impossible to appreciate the meaning and importance of the differences in the weight of the various organs.

Still, another point may be mentioned in this connection, and that is that age, or more properly, senility, has also an effect on the size and weight of the different organs, which makes it advisable to give with the other records an approximate age of the individuals. As the securing of these additional data and recording of the weights and measurements according to the metric system will involve but little additional labour, it is hoped that they may be furnished in all future communications on the important subject of the weights and measures of human organs.

Very respectfully,

ALEX. HRDLICKA,

Curator, Division of Physical Anthropology, United States National Museum.

Smithsonian Institution,
United States National Museum,
Washington, D.C.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"The Philippine Journal of Science," vol. vi., No. 5, November, 1911.

Amœbiasis.—Chamberlain and Vedder have tried the effects of ultra-violet rays on amœbæ and discuss the use of these radiations in the sterilization of water in general. Their experiments demonstrate that in a water supply amœbæ, whether mobile or encysted, and balantidia may be easily killed by a comparatively short exposure to ultra-violet rays. If this discovery can be applied commercially to the sterilization of water in general, then a very important advance in hygiene for the tropics will have been made. The authors hope to test an apparatus manufactured for the purpose in the near future and the result will be awaited with great interest.

"The Philippine Journal of Science," vol. vi., No 5, November, 1911.

Rice and Beri-beri.—Chamberlain and Vedder have made some progress in the identification of the neuritis preventing substance contained in the extract of rice polishings prepared by the method described in a previous paper of their own. The neuritis preventing substance is dialysable, is soluble in water, in 95 per cent. alcohol, and in 0·3 per cent. hydrochloric acid. It is easily decomposed by heat and has a strong affinity for bone black. The same substance or a similar substance is also contained in a decoction of ordinary white beans. It appears therefore to the authors that there is sufficient information regarding the nature of the substance to attempt to identify it by direct methods of chemical analysis, and experiments have now been begun to try to do this.

"Yellow Fever Bureau Bulletin," vol. i., No. 9, January, 1912.

Yellow Fever.—Lebredo in his report on yellow fever in Merida concludes :—

(1) That there is to-day an endemic focus of yellow fever in the Gulf of Mexico.

(2) That Merida is to be considered, *in the first place*, to-day as a seriously infected locality, and very dangerous.

(3) That for the reasons given, the close contact, the lack of effective defences, and the short time since the last outbreak, Campeche should be considered as suspicious, perhaps as dangerous, as Merida, and certainly to be included in the territory subject to quarantine precautions, the same as Progreso.

(4) That persons coming from Quintana Roo should be watched by the Mexican sanitary authorities, who, by a careful study of the fevers affecting the soldiers, might surely obtain very interesting results for the history of the past epidemics of Merida and Campeche, as well as for protection in the future, after success has crowned the present efforts.

(5) That Vera Cruz, and other ports on the Gulf, where cases may arrive in the infective period of the disease, an event which might have happened during Lebredo's stay in Merida or before, should establish, *for a prolonged period of time*, a careful observation, and prolonged study to determine the final establishment of complete eradication.

"The Journal of the American Medical Association," vol. lviii, No. 8, February 24, 1912.

The Sand-fly and Pellagra.—Hunter, Professor of Entomology, University of Kansas, contributes an interesting paper on the sand-fly as the transmitting agent in pellagra. He approaches the subject from the scientific side, and has started experimental work to prove or disprove the theory. The only species of sand-fly found in Kansas so far is the *Simulium vittatum* and flies of this kind were fed on a pellagrin in the second season of the disease and then on guinea-pigs and monkeys. One monkey after being subjected to repeated bites by sand-flies that had fed on the pellagrin became ill, was eventually chloroformed, and its tissues are now being examined by a pathologist and neurologist. Control experiments are being carried out at the same time as these experiments on animals, and some definite information, it is to be hoped, will be gained either for or against the simulium theory advanced by Sambon. This is the right way to go about the subject, and further reports will be awaited with interest.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

A CASE OF PEMPHIGUS CONTAGIOSUS.

By P. H. Macdonald, M.B., Ch.B.Edin.
Southern Nigeria.

On the morning of September 19, 1911, a boy, a native of Beude, aged about 17, arrived at one of the dispensaries near that district.

Appearance on Admission.

There were several raw pink areas, some as much as ½ in. in diameter, on the front of the chest and on the forearms. On the same areas and on the cheeks near the angles of the mouth were bullæ. Those on the face were about the size of peas, and so were several of those on the other parts affected, but on the latter parts there were also much larger bullæ. Some of these larger ones were as much as ¾ in. in diameter. The small ones were tense and had a somewhat pearly lustre, and on puncturing a clear colourless fluid exuded; they also were perfectly round in outline. The larger flaccid ones exuded clear fluid on puncturing, but many of them had a sinuous edge. Those which had been previously ruptured before admission displayed a viscous straw-coloured fluid, projecting from the ruptured vesicle in the form of a clot. The boy stated that three days before, at Itu, a place on the Cross River which he had been visiting, he noticed the blisters appearing on his forearms, then on his chest, and then on his face. Microscopic examination of smears from the fluid of the vesicles stained with Loeffler's methylene blue showed numerous diplococci. The boy said he felt quite well, except for the itching sensation in the vicinity of the vesicles which compelled him to scratch. The next day new vesicles were found over the arms and the front and back of the thorax and abdomen, and on the face; and the day after that the boy, in the morning, had difficulty in talking, and examination of the mouth showed vesicles on the tongue at the edges and tip, and on the roof of the mouth. New bullæ were also found on the parts previously affected, and on the lower limbs. The boy also had a slight cough. For the next two days new bullæ again appeared on the parts already affected.

Some of these bullæ became very large, even about 1½ in. across. These, on rupturing, first exuded clear, watery serum which became later darker, amber-coloured and more viscous, leaving pink denuded areas of skin.

These pink areas, on account of the boy scratching them and on account of the effusion of neighbouring vesicles, increased greatly in size. The older areas of skin became varnished in appearance, and the bright pink colour of the recent raw areas faded considerably. The boy presented latterly an extraordinary appearance, on account of the enormous surface of skin, head, neck, body and limbs, involved. He became very depressed and miserable, and had difficulty in talking and swallowing. He became daily weaker, very emaciated, and died on September 29, fourteen days after the beginning of the illness.

Treatment.

The blisters as they appeared were punctured, and the skin frequently washed with a 1 in 3,000 pot. permanganate lotion, and after that an antiseptic dusting powder was freely applied. Later, when there was such a large area of skin involved, boracic ointment on lint was applied and cotton wool bandages to keep the dressing in position. The bronchitis was treated by a simple expectorant mixture; the vesicles in the mouth were punctured, and glycerine acid. boracis applied, a pot. permang. mouth wash being also used. At first the boy's appetite was good, and he had ordinary food, but after the mouth was affected only fluid nourishment could be taken. From the fourth to the eighth day of the disease the boy had a slightly raised temperature, the highest point to which it rose being 100.6° on the seventh day. During the rest of the illness the temperature was normal and sub-normal. This raised temperature was possibly due to the attack of bronchitis.

Points of Interest.

(1) The disease started on the forearms. The axillæ were not specially involved, nor primarily.

(2) Manson and Castellani's text-books make no mention of the disease affecting the mouth.

(3) The enormous area of skin which was denuded.

(4) The disease terminated fatally.

(5) The occurrence of this disease in Southern Nigeria.

SLEEPING SICKNESS IN THE GAMBIA.*

By Emilius Hopkinson, M.A., M.B.
Protectorate Medical Officer, The Gambia.

Sleeping Sickness is a well-known endemic disease of the Gambia, but fortunately is at the present time not a common one, though formerly it is said to have been much more so.

Since I have been in the Protectorate (since 1902) I see, perhaps, half a dozen cases a year, all of which have eventually terminated fatally, but during my last tour it so happened that I personally came across none. As I see some 1,500 new patients each tour, this number would show that sleeping sickness only occurs in the proportion of 3 per cent. of all disease. Taking everything into consideration, that many cases are too bad to be brought to me, I do not believe that this disease occurs in a greater proportion than 1 per cent. of all disease. During the same period, I have also known of two Europeans (officials) who have contracted the disease, and I believe that there was

* Reprinted from the Report of the Gambia Medical Department, 1910.

also a third case, about 1903, in a European, a Roman Catholic missionary. Of the two first, one (Forde and Dutton's) was the first case in which the disease was recognized in a European, or at any rate the first in which the actual causal organism was discovered. The other case occurred some three years ago; the patient was put on arsenic early, sent home at once, and after a course of this drug made an apparent recovery, and kept well while taking it, but suffered a relapse when he left it off, to recover again on resuming treatment. He is, I believe, still alive. A fourth case occurred in a mulatto trader. Of these four cases, in the three that were fatal death occurred within eighteen months.

Among the natives of the Protectorate the disease is well-known and feared as always fatal, but all agree that it is not nearly so frequent now as it was in their forefathers' time. They have no knowledge of its cause, and do not connect it in any way with the bite of the tsetse-fly. Recently, however, a certain number of the more intelligent have believed me when I told them how the disease was spread, and now make some attempt to avoid being bitten. As regards cure, they know of none; but there is a common belief that somewhere to the north (in Senegal) there is a place where the disease is cured, at any rate for as long as the patient remains there. The Headman of Sami once told me that his brother was taken there, when so ill with sleeping sickness that he had to be carried, and that within six months he was well again. He stayed there a year, and as a sign of and a thanksgiving for his complete recovery, learnt to read the Koran. Afterwards he came home again apparently quite well, but died within six months of his return.

As regards treatment we use atoxyl and arsenic. In no case, however, have we had a permanent cure in the Gambia, though in practically every case, except for one or two in the very last stage, there has been some temporary improvement, but remissions are not uncommon in the ordinary untreated course of the disease. The least discouraging case which has come under my notice was a boy, about 16 years old, from Kudang, who was brought to me with the disease well advanced. He was nearly always asleep, and hardly woke up even for food. He had been much neglected by his relations, and was altogether in a bad state, much emaciated, filthy and covered with sores. I put him on atoxyl, fed him up and kept him with me till I could send him to the hospital in Bathurst, where the treatment was continued. Within a fortnight after the commencement of the atoxyl he had begun to improve; he slept less, he took interest in his surroundings, and his skin got healthy; after about two months he was apparently nearly well, though still liable to fainting on the least exertion, while his blood still contained trypanosomes, but in much smaller quantities than at first. Five months after all symptoms had disappeared, and he seemed to be in perfect health. He remained in Bathurst for nearly a year, still taking arsenic at gradually increasing intervals, and keeping well, except for some slight troubles due to the arsenic, on account of which its administration had to be temporarily interrupted. His people then, seeing, I think, that he was now well and strong enough again to work, insisted on taking him back to Kudang; here he died during the following rains of "dysentery," they said, and that he had never shown any signs of a return of the sleeping sickness. We can hardly count this as a cure, but at any rate life was much prolonged, and a mere vegetative existence changed into one of tolerable enjoyment of the attractions of this world, and I believe that had it been possible to keep him under the treatment, he might still be alive.

The sleeping sickness patients I have seen have come from various parts of the Protectorate, and not, I think, more from one part than another, though I am rather under the impression that the Kiangs have provided rather a larger proportion of the comparatively small number of cases I have seen than they should have, but then I have spent probably more time there than in any other one district. Without my register of cases to refer to, I cannot give a list of all the cases I have seen. But I remember patients from the following places: Faraba in the Upper River, Lamin Koto, McCarthy Island and Sami in the McCarthy Island Province, Salikenni (2) in Baddiboo, Albreda in Niumi, Kaiaff and Kwinella in the South Bank, Mandowa and Willimissa in Kiang, and two cases in Bathurst, either from Bathurst itself or some adjacent town in Kombo.

One may say, therefore, that no part of the Gambia is safe from the disease, and its presence must always be a constant menace. In the neighbouring French territory, the Upper Gambia, above the Barrakunda Rapids, has, or rather till within the last few years had, the reputation of being a bad country for sleeping sickness and to absolutely swarm with tsetse-flies, so much so that for some 150 miles above our boundary villages were few and far between; but within the last few years I hear from people who have been there recently that the villages are increasing in numbers and size along this part of the river, though, from all accounts, the tsetses are as abundant as ever.

The course of the disease, as seen in the natives of the Gambia, shows a gradually increasing torpor, which, within two or three years, interrupted perhaps by longer or shorter intervals of quiescence and apparent return towards health, develops into an almost constant slumber, from which at first the patient wakes at meal times to take food, but which later on becomes heavier and more continuous, so that he has to be violently wakened to be fed. Eventually he dies, absolutely comatose, unless some intercurrent disease carries him off before the typical termination is reached. Long before the actual sleeping stage comes on, the patient is noticed to be dull, indolent, and to lose interest in his surroundings and occupation; he is liable to irregular attacks of fever and severe headaches, and may have an occasional fit, while a

very constant concomitant of the malady is the presence of an itching impetiginous rash on the skin, which at first the patient scratches till it is raw, but later on, as his feelings become dulled, he leaves alone, so that towards the end the skin is almost normal, though often slightly cracked and much drier than it is in health. From quite an early stage a sleeping sickness patient is disinclined to talk, a most unusual state of affairs in a negro—he will hardly answer when spoken to, always seems tired, looks sleepy, as if he can hardly keep his eyes open. When the disease is well developed, but before the stage of torpor is reached, the heart shows signs of failing, and the least exertion is often followed by palpitation, shortness of breath or syncope.

In Europeans the disease is more rapid—they appear rarely to live till the real sleeping stage is reached. First of all irregular fever, not amenable to quinine, is noticed, and this is accompanied by frequent headaches, gastric disturbances and a distinct change in temper and demeanour, the patient becoming alternately unnecessarily irritable or unusually careless and troubled. In the European the skin change is a peculiar dryness associated with a red macular eruption, which changes position from day to day, but tends to preserve a more or less circular or crescentic outline. This kind of skin lesion Sir Patrick Manson has pointed out is exactly the counterpart of that as seen in the black races, which one would expect to find in the thinner, cleaner and commonly covered skin of the European.

One year I examined for the presence of enlarged post-cervical glands all the children who, in the ordinary routine, came to me for medical treatment or vaccination. I cannot now remember the percentage which showed this clinical sign, but it was not a very large one, and the few whom I have since seen of those who had such enlargement are still well. The main fact, however, impressed on my memory by this examination was that, however valuable this sign may be as an index to the disease, the occurrence of such enlargement of glands varies from extraneous causes enormously in different races; in my series I find this glandular enlargement about four times as frequent among the Joloffs as among the Mandingoes, and this proportion expresses well the relative ideas of cleanliness of these two races in the Protectorate; of course, dirty heads are a frequent cause of such chronic adenitis in all races.

Among the Mandingoes in the Gambia it is the almost universal practice to " cut the neck-stones " kanta-berro (kuntu) of all the male children, and this operation is believed to prevent the occurrence of sleeping sickness in later life. The operation consists of making a small incision on each side under the centre of the ramus of the jaw, removing a small piece of tissue (supposed always to be a gland), and then keeping the wound open for some days so that a distinct scar is left. The incision is usually about over the sub-maxillary salivary gland, but I am pretty sure that this is scarcely ever (or never) reached, and rather doubt if in most cases even a lymphatic gland is removed, as the cut is never a deep one and the bit removed always most minute. Our knowledge though of the connection of the trypanosomiasis and the lymphatic gland makes this native custom of particular interest, as showing that they, too, seem to know or imagine some similar connection, but one can hardly believe that the practice can confer any sort of protection, even if the glands were really removed. Practically every Mandingo bears the scars of the operation, and I can remember at least one case of sleeping sickness who died in spite of the presence of good scars.

I ought to have mentioned before that, as far as my experience goes in the Gambia, males are much more frequently affected with sleeping sickness than females. There would seem to be but little reason for this, as all the rice cultivation is done by the women, a laborious work, which takes them into the swamps, and therefore into tsetse-fly areas at the very worst season, namely, during the rains.

Tsetse-flies are found practically everywhere in the Gambia, but are much more numerous in some places than in others. The parts of the country most infested are Niumi, Fogni, and Western Kiang, along the Vintang and all the other creeks below McCarthy Island, at any rate, all those which I have been up, for in such places these flies absolutely swarm, and travellers by boat, in spite of constant watchfulness, cannot avoid being frequently bitten. In Bathurst I have only seen tsetse-flies at the end of the rains, and then but few, though within six miles, near Jeshuaan, there is a place where they are numerous and to be found all the year round. There are two quite different kinds of locality which these flies haunt in the Gambia, one, the typical situation, the water or swamp-side, where thick grass and dense jungly growth often shaded by large trees abounds, or (in Niumi particularly) in real forests, damp but not necessarily close to water. The second locality is among the bamboo, belts of which clothe the ironstone ridges near or along the boundary, especially from behind Chakunda, on the south bank of the Upper River, to behind Kaiaff, in the South Bank Province. Here, in by no means the kind of place one would associate with tsetse-flies, as they are waterless and for the greater part of the year dry and burnt up, tsetses, a horse-biting species particularly, are most numerous and troublesome even during the dry season. There is one little point which is worth noting about these tsetses; when three or four horses are travelling, riding in single file along the ordinary bush path, the leading horse will be covered with the flies, the second may occasionally carry one or two, but those following will be left absolutely unmolested.

From specimens caught in the Gambia, the two common species, *Glossina palpalis* and *G. morsitans*, the carriers of sleeping sickness and horse trypanosomiasis respectively, have been identified as occurring in the Gambia together with at least

one other species. Of those sent home so far, the larger number have been found to be "palpalis," but this may be merely accidental, and the proportion may be reversed when more identified. At any rate, a knowledge of the country and relative frequency of horse and man trypanosomiasis would make one think that the horse-biting species must be much the more abundant.

Native tradition asserts that in earlier times the disease was much more prevalent in the Gambia than it is now, and whole districts, now desirable dwelling-places, are said to have been uninhabitable. In the Protectorate, this particularly applies to Nianija, which, in former days, bore such evil name that its inhabitants were few or non-existent; but it is now a rich and fairly thickly populated country, inhabited mainly by Turankos, a branch of the Foulah race and a prosperous people, who are the owners of large quantities of cattle. Accounts, too, of the slave trade and the frequent awful mortality among the slave gangs and slave-ship cargoes from this disease, all provide additional evidence to show in those days sleeping sickness was a much commoner disease in the Gambia, one of the chief centres of the export trade in slaves, than it is now.

May we not hope that this awful scourge is really on the wane here, and that cases will get fewer and fewer year by year?

Can it be that the natives have acquired some degree of immunity against trypanosome infection?

Several facts seem to point this way. Tsetse-flies of all sorts abound in the Gambia—a country which is merely the banks of a tropical river and which consists for at least half its area of the alluvium and swamp which fringe such a river. Here there is every environment favourable to the life and increase of these flies. Cases, few in number though, do occur every year, so that foci of possible infection are present, and practically everywhere we have the tsetse to carry the infection. Human carriers, too, would always be numerous, for travellers are many, some for trade, others for agricultural purposes, these being the hundreds of "strange farmers" who come in every year for the rains to plant ground-nuts in British Territory. As peace and prosperity prevail everywhere, there is absolutely nothing to hinder frequent intercourse between all parts of the Protectorate, and of the surrounding portions of French Territory. This intercourse is large and widely spread, and means continual coming and going, for our river is still, as it has been for a century or more, the main highway from the sea to the Soudan and the interior, so that nearly all the produce of, and nearly all the imports for the neighbouring countries, as well as our own, are carried to or from our river, which provides easy water transport to Europe. With such frequent movement, therefore, from one end of the country to the other, there must be every facility for the spread of sleeping sickness, as there are so many places where travellers in our territory must meet with tsetse-flies—in many places, indeed, it would be impossible even to take the shortest journey without passing through a tsetse haunt.

How is it, then, that under these conditions, instead of one case here and there, we do not see one case followed by others infected from it, till by now the terrible state of affairs which prevails elsewhere has been reached, if our people are not more immune to the disease, having acquired this immunity in the days when sleeping sickness was much more prevalent than at present?

The general conditions favourable to the incidence of the disease must, one would think, be much the same round the Uganda Lakes or in the Congo as in the Gambia; the actual morbid agent, the trypanosome, is the same, the same carrier, the tsetse-fly (more particularly *G. palpalis*) is present. Yet in one place the disease is decimating (or worse) the people, in the other, though fatal to those it attacks, it is uncommon. Our people no doubt have the advantage over the inhabitants of Uganda in the matter of stamina, as the Gambia natives are a fine, strong people, of good physique and constitution; many are quite wealthy, all are comfortably off, and there are certainly nowadays no very poor or absolutely destitute, for everyone can get enough to eat, and nearly all live really well. The ground-nuts they grow bring them in good return in cash, and their cereal crops provide a great part of their food, while any additional food-stuffs they require or little luxuries can be obtained at prices but little above those ruling in Europe, at the numerous trading factories, which are dotted at frequent intervals all the way up the river. Whenever, too, there has been any failure of the food crops, or the slightest likelihood of a coming shortage of food, the Government has always been in the habit of issuing rice at cost price on credit to all who required it. In every way, therefore, our people have all the aid which good food and good living can give towards good health and resistance to disease.

The situation of the towns, too, probably compares favourably with what is the case in Uganda. Practically all the native towns are situated at a distance (generally at least two miles) from the river, and usually at least half as far from any swamp or other likely hold for tsetses, and they are always surrounded by a cleared tract, the cultivated area, the extent of which naturally varies with the size of the town, but is always round all the towns or villages of any size, at least a mile across. Tsetse-flies never live in such towns, but the same cannot be said of any of the Jola villages in Fogni, a thickly-wooded part, full of swamps and abounding in tsetse-flies, or of the numerous trading stations on the river, or its creeks, or stations, which are increasing in size and number every year. Most of these are situated actually in the swamp which borders the river, while the usual dense water-side growth is, as a rule, only cleared along the actual frontage of the station.

From the health point of view, one can only say that most of the trading stations are most unsuitably situated, but on the other hand, such

positions are necessary from the trade point of view, as close access to the waterway is essential to facilitate landing and shipment of goods.

Another minor point of difference between the Gambia and Uganda is the fact that our people eat large quantities of Kola nuts, a habit which, I believe, does not extend to East Africa. This habit can scarcely give any real protection against trypanosomiasis, but I mention it as the natives thoroughly believe that Kola is "good medicine" and a preventative of many diseases, and it is, undoubtedly, a wonderful stimulant and antidote to fatigue, and its use in moderation seems to do nothing but good to its votaries.

Although all these are favourable factors on the side of general resistance to disease, one can hardly believe that to them alone is due our present comparative freedom—long may it continue—from the scourge of sleeping sickness. So that taking everything into consideration—the established presence on the Gambia of the trypanosome, of myriads of its carriers, the tsetse-flies, and of its results, cases of disease—I am driven more to the belief (and hope) in a degree of acquired immunity among our people.

On this question of immunity, the presence and effects of trypanosomes in the domestic animals may throw some light, reasoning on the lines of analogy.

Horses live but do not really thrive anywhere in the Gambia, though in the Upper River Province they do much better than elsewhere. In most places it is quite the exception to see a really fit horse, and nowhere can one say of them, as one certainly can of the donkeys and cows, that practically all look fit and well. Trypanosomiasis is the disease most fatal to them, and to it they are extremely susceptible. If a horse is taken into a tsetse district even for the shortest time, there is every likelihood of his being infected, while in those districts where the fly is most abundant horses will not live a year.

Donkeys do well and look well nearly everywhere, and though they are not nearly so well cared for as, and do much more work than the horses, especially in carrying the ground-nuts to the wharves, and therefore go much oftener into tsetse areas, trypanosomiasis is rare in them. Captain Todd, the veterinary surgeon who visited the Gambia a few years ago, found only one case of this disease in a donkey, which also, I believe, was the only sick donkey he saw, as against innumerable sick horses.

Cattle take us a step further, for they must surely have reached immunity. Trypanosomes are commonly found in their blood—in the blood, too, of absolutely healthy beasts (Dutton and Todd, 1902), and yet our cattle are by far the healthier of our domestic animals and in every way do the Gambia credit. They are extremely numerous all over the Protectorate, and practically always look fit and well, except for occasional slight epidemics of other cattle disease, and towards the end of the dry seasons, when they may suffer from shortage of pasturage. Their range, too, is spreading into districts where formerly cattle could not thrive. Both in Fogni and Niumi during the last nine years one has seen a great increase in the number of cattle kept, especially so in the first named. With this may be compared the increase of population which has in former years taken place in certain parts of the Gambia, and with that which is now occurring along the French Upper Gambia. Is it not fairly reasonable to suppose that the people in the one place and the cattle in the other have increased as their resistance to their respective diseases increased?

PIGMENTED MACULÆ ON THE TONGUE, GUMS, AND PALATE.

By Lieut.-Colonel R. H. Castor, I.M.S.
Burma.

Melanoglossia.

Number found in Different Castes.

On two separate occasions the whole of the prisoners in Myingyan Gaol, numbering over 1,200, were examined for melanoglossia, and it was found in 1.1 per cent. of them.

On December 4, 1911, a more careful inspection was made of 1,256 prisoners, and they were comprised as follows: Burmans, 1,024; Shans, 122; Karens, 22; Hindus, 20; Arakanese, 16; Chinese, 15; Chins, 14; and Mohammedans, 11. Of the Hindus there were eight each from Punjaub and Bengal and four from Madras; of the Mohammedans nine were from Burma and two from Punjaub; of the 1,256 prisoners examined, twelve were female, eleven Burmans and one Chin. None of them showed signs of melanoglossia. Of the fifteen showing signs of melanoglossia, eleven were Burmans, two were Bengal Hindus, one was a Karen, and one was a Shan.

The percentages for melanoglossia were as follows: Hindus, 10 per cent.; Karens, 4.5 per cent.; Burmans, 1.5 per cent.; and Shans, 1.8 per cent.

It will be seen, therefore, that the percentage is highest among the Hindus and lowest among the Shans, though one must add that the figures are too low for all the castes, except Burmans. This prevents one, therefore, from drawing any definite conclusions on this point, excepting for Burmans. While at Bassein, in 1902, this subject also interested me, and of about 1,200 prisoners examined there, melanoglossia was found in twenty-six of them. I am unable to give the total number of castes examined there, as unfortunately I kept no record of them, but those in which these markings were found were of the following castes: Hindus, 18, of which fourteen were from Madras, two from Bengal, one Sikh, and one from the United Provinces; Burmans 7 and Mohammedans 1, from Madras.

Distribution of Patches.

At Myingyan, of the fifteen cases examined, in only two of them were they not situated on the

sides of the tongue. The positions on the tongue occupied were these: Both sides, six cases; both sides and centre 4; in one of these cases half the tongue was affected, in the centre 1, on the right side 1, on the left side 2, and in one of them the patch was red. At Bassein, of the twenty-six cases examined, the results were as follows: Both sides 9, both sides and centre 2, in the centre 3, all around the edges of the tongue 1, left side 2, with blue patches and back of tongue with three small round red patches 1 case, more than half the tongue black 1, and in one of these there was a red patch only.

It will be seen, therefore, that out of forty-one cases the pigment was most frequent on both sides 15, then on both sides and centre 6, left side only 5, centre 4, right side 3, left side and centre 3 and in five of them in the other positions named. In one case half, and in another case more than half, of the tongue was occupied, and in two cases there were red patches only. In one case the patch was in the centre of the tongue, and in another case more in the posterior portion of it. In six cases combined patches of blue and red were found on the same tongue; in three they were about the centre of the tongue, and in the other three they were more on the dorsum of the tongue towards the edges.

Number of Patches.

At Myingyan the number of patches varied from one to seven. In five of them there was only one patch, in two cases the pigment was continuous in a single line around the edges, and in the other cases there were more than two patches, the majority having three. At Bassein the number of patches varied from one to eleven; in six of them there was only one patch, in one case only was the pigment continuous in one line; the other cases showed more than two, the majority having five or six.

Colour of the Patches.

The colour of the patches was certainly not blue, but blackish blue and lighter shades of this colour. In two cases the colour was reddish. In six of them the red and blue patches were seen on the same tongue, in four of these the red patches were quite separate, and in two of them the blue patches were surrounded by red outlines.

Shapes of the Patches.

Bluish Black Patches.—In the great majority of cases they were oblong; in four cases they were sore or less round; in two cases they had a curious speckled look; in one case it was star-shaped; in another the large patches were separated by a series of spots.

Red Patches.—In four of the cases they were more or less round. In two of the cases they were also round, but much smaller. In the two cases in which the red pigment surrounded the blue patches they were practically of this same shape.

Sizes of the Patches.

They varied from a millet seed to an area occupying more than half the tongue. The majority were of the size of four-anna and two-anna bits.

Ages.

The ages of those examined varied from 14 years to 70, and those showing signs of melanoglossia varied from 19 to 53.

At Bessein the ages of those with melanoglossia varied from 19 to 78 years.

It would seem, therefore, that these pigmentary changes do not appear before a certain age, not younger than 18 or 19 years.

Diseases Associated.

At Myingyan the diseases associated were: Debility 2 cases, diarrhœa 1, syphilis 1, leper 1, tinea circinata 1, anæmia 1, tuberculosis of the lungs 1, making in all 8 cases. In seven cases no diseases were found.

At Bassein the diseases associated were: Pneumonia 2 cases, dysentery 2 cases, rheumatism 2 cases, and one each of debility, itch, fracture of the neck of the femur, hydrocele, diabetes, tubercle of the lungs, beri-beri, and dog-bite, making in all fourteen cases. In twelve cases no diseases were found.

Remarks.

With reference to diseases associated with melanoglossia, it may be marked that at one time it was thought that if the tongue was pigmented, especially on each side of the median line, it was characteristic of ankylostomiasis. Further, by some authorities, cases of so-called "black tongue" are due to mucorinacæ of the genus rhizopus. If one looks at the diseases associated with melanoglossia at Bassein and Myingyan, it will be noticed that in about half the cases there were certain diseases present, but no connection can be traced between these patches and the disease named.

Maynard describes melanoglossia as follows: "The distribution and extent of the discoloration varied greatly. In some cases the fungiform papillæ were each surrounded by a blue or brown rim, giving the tongue a curious speckled look; in others there were irregular blue or black "blotches, simple or multiple, and varying in size from a two-anna bit to a rupee on the dorsum or along the edges of the tongue. In one only was the whole tongue black. In no cases were the gums or roof of the mouth pigmented. The marks were found at all ages, though more commonly more widely spread and of deeper hue in adults than in children."

He adds: "Thus, melanoglossia, as far as these 347 cases go, would appear to be largely a question of race, and to be more common the lower the race is in the scale of civilization. It is almost equally common in the two sexes. It would appear to be hereditary, though not necessarily appearing in early childhood. No connection with any diseased condition was to be made out."

In none of my cases were patches found near the fungiform papillæ. In no cases of mine was the whole tongue affected. In my cases no women

were affected. I regret I cannot offer any opinion on the question of heredity. It will be seen that in many other respects my observations confirm the above description of melanoglossia.

Pigmented Gums.

The same number of prisoners were examined for black gums, and they were present in 172 of them, or 13 per cent.

Castes, Races, Tribes, &c.

These were the same as before.

The caste percentages were: For Burmans 15.5, Shans 32.7, Arakanese 6.2, Hindoos 25, and Mussulman 9.1.

They were therefore highest among the Shans and lowest among the Arakanese, though one must add again that the figures for all the other castes except Burmans are too few to draw any definite conclusions from them.

Distribution of Markings.

Among the 161 Burmans in which they were found, they were present in both upper and lower gums in 113 of them, on both sides of the lower gum in 29, on both sides of the upper gum in 14, on both lower sides and right upper side in 3, and on both upper sides and right lower in 2 of them.

In an Arakanese it was found on both sides of the upper gum; in one Hindu it was found in a similar position. In the other four Hindus they were found on both sides of the lower gum. Among the four Shans they were found on both the gums. In the Mussulman they were situated on both sides of the lower gum.

The total thus works out as follows: On both sides of the upper and lower gums 117 cases, on both sides of the lower gum thirty-four cases, both sides of the upper gum sixteen cases, both upper and right lower gums two, and both lower and right upper gums three cases.

Number of Patches.

In most cases they were not distinct; in some cases they were separated and amounted to four or five, in other case there was only one patch.

Colour of the Patches.

The colour was blackish blue of different shades. In a small minority they were black.

Shapes of Patches.

In some cases they were more or less circular, in others oblong or square or shapeless. A few gave a curved appearance, the highest part of the curves corresponding to the roots of the teeth. In some cases these lines were very narrow and in other cases they were quite broad. In a few cases there were two separate lines separated by a clear interval.

Sizes of the Patches.

They varied from a pea to about half-inch square. In very few cases did they occupy the whole of the gums.

Ages.

The age of those examined varied from 14 to 70 years, while those in which markings were found varied in age from 14 to 43 years, so apparently they develop when very young and disappear in old age.

Diseases Associated.

Of the Burmans one had scabies, one had tinea circinata, one had his left knee-joint ankylosed, and one was a leper.

Pigmented Palates.

Prisoners numbering 1,256 were examined for black palates and they were found in .87 per cent. of them.

Castes, Tribes, Races, &c.

These were the same as mentioned under black tongues. They were only found among Burmans in eleven cases (1 per cent.). The percentage among all classes came to .87.

Distribution of Patches.

A very large number of prisoners had a pigmented streak running down the centre, where the two bones forming the palate join together. Sometimes these lines were very small, in other cases the lines extended to about 1½ in. All cases showing only these lines were excluded. The pigmented maculæ taken into account were those situated on either side of the median line and quite separated from it or extended beyond the median line. There were eleven such cases and the pigment was distributed as follows: On both sides and centre five cases, on the left side and centre three cases, on the right side and centre one case, on both sides one case, and on the left side only one case.

Number of Patches.

Among the eleven cases they varied from one to five. One had five patches, one had four patches, two had three patches, three had two patches, and four had one patch.

Colour of the Patches.

They varied from a purplish tint to one of a bluish black colour.

Shapes of the Patches.

Some were fairly round, others were oblong, others were more elongated, and others again were wedge shaped or shapeless.

Sizes of the Patches.

These varied from a spot to areas about an inch square and a little more. In one case practically the whole of the soft palate and posterior part of the hard palate was pigmented.

Ages.

The ages of those examined varied from 14 to 70 years, while those in which these patches existed varied from 20 to 45 years.

Diseases Associated.

There were no diseases associated in these cases.

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THE JOURNAL OF

Tropical Medicine and Hygiene

APRIL 15, 1912.

SOME PHYSICAL CHARACTERISTICS OF THE MONGOL.

CHINA has figured so largely in the eyes of the world lately that it may be interesting to bring forward some of the more prominent anatomical features which distinguish the Mongol type generally. The Yellow or Mongol race people Eastern and Central Asia as a true stock, and offshoots of more or less intermingled blood stretch across Asia into Eastern Europe, and southward into Burma, Nepaul, the Malay States, and Indo-China. They constitute one of the three great types of human beings, and were colour to serve as a basis of classification they might be styled the xanthoid type. Beyond colour, however, they have certain peculiarities which are distinctive.

The bony frame generally is of a more slender type than the Indo-European, and especially so than the Teutonic or Saxon. The stature of the majority of the race is less than the Indo-European; this is especially seen amongst the Japanese, the Southern Chinese and the Gourkhas; on the other hand, the Koreans, the Northern Chinese, the Thibetans, Bhootans, &c., are taller. The muscular system is capable of great development; the calf of the leg is conspicuous in its development and particularly so amongst the labouring classes, a feature which stands out prominently when compared with the flat calf of the negro and the very slim legs of the majority of the people of India, including the big warlike men of the north-west frontier and Afghanistan. The skin of the Mongol seems more delicate than that of either the negro or the white man. Except for the abundant crop of hair on the scalp the Mongols are peculiarly hairless; not only are the chest and limbs free of hair, but the beard and moustache never attain ample proportions. The hair on the upper lip is meagre in amount, the follicles are widely apart and they are confined to a narrow strip halfway between the nose and the edge of the upper lip, so that the lower part of the lip is quite free of hair. The whiskers and the hair on the chin is similarly scanty, the beard never bushy but consists instead of isolated hairs, giving the beard a straggly appearance. In fact, the hair on the face was seldom allowed to grow until towards middle life; yet with all the constant shaving a poor crop of hair resulted. The hair of the head of the Mongol is oval in outline, not round as in the Indo-Europeans, and, of course, totally different to the woolly covering of the negro; so that each of the three great races has hair of a type peculiar to itself.

The most marked feature of the Mongolian type, however, is the so-called "obliquity of the eye." There is, however, no "obliquity of the eye," the bony orbits show no obliquity and the appearance given to the eye is due to a fold of skin on the inner side of the upper eyelid. The presence of this fold is a new developmental feature of considerable interest. Looking at the features of a Chinaman or at the bones of the frontal aspect of the skull, one is struck by the smoothness of the region. The frontal eminences are but faintly apparent; the frontal sinuses are not developed, there are no lumps as in the European skull, hence the "boyish" appearance of a Chinaman even in middle age. It was this facial aspect that no doubt inspired Bret Harte when he baptized "Ah Sin" as wearing an expression which was "child-like and bland." The expression was not assumed by "Ah Sin" for the occasion, for it is a developmental feature common to all his race, for which not the mental attitude but the bony framework is responsible. Along with the absence of marked frontal eminence and part and parcel of the same development, the bridge of the nose remains flat through life. In European infants and children the same features obtain, but at puberty the frontal sinuses expand, the bridge of the nose rises, and the fold of skin at the inner aspect of the upper eyelid as it passes on to the side of the nose disappears. In fact, in the Mongolian the frontal nasal region remains flat and smooth as in European children, and the upper eyelid fold is a feature of adult years, not of pre-puberty age only. By seizing the skin over the bridge of the nose of a Mongol between the

finger and thumb and raising it, the fold of the eyelid disappears and the so-called obliquity of the eye is seen to disappear with it.

The absence of the development of the air-cells in the frontal and nasal region no doubt also accounts for the peculiarity of the voice in Chinamen. It is never deep and sonorous as in the case of a European male. The breaking of the voice in European boys is associated with the rapid development of the air-cells of the skull, but this takes place in the young adult Chinaman to but a meagre extent. The Chinese style of singing is a consequence of this; it is always pitched in a high falsetto, never in the "natural" voice as we understand it.

The general outline of the Mongolian face is in keeping with this want of development of air-cells in the region of the cranium.

The brain of the Chinaman, on the average, weighs more than that of any other race of mankind. It is possible and highly probable that this is due to the long period during which the masses of the Chinese have been educated, for in no other country has education prevailed to the extent it has amongst them. Amongst other people, education has been confined until quite lately to a small section of the community. In several nations in Western Europe universal education has been introduced within the past fifty years only, but in some European countries a small proportion only can read and write even at the present day; but in China for thousands of years almost all men have been trained to read, write and count, and higher education, especially in philosophy, has for the same period of time obtained amongst a large proportion of the population. If there is any truth in the belief that the size of the brain is affected by a long process of education of the people, the instance of the Chinese would seem to prove it. Next to the Chinese brain the Scotch brain is given in text-books as the largest; this may be accounted for also by education, for in Scotland education has been almost universal for over three centuries, ever since, in fact, John Knox's simple ruling was followed: "All children must be educated; poor men's sons must be helped." In no other European country has the same obtained, but what we speak of in centuries the Chinese have followed for thousands of years. The Yellow peril is a peril due to brain power, if there is any basis for associating intellectual capacity with the size of the brain itself.

"Medical Record," vol. lxxxi, No. 11, March 16, 1912.

Malaria in an Infant.—Henderson of New York reports a case of malaria in an infant five months old, the symptoms simulating very closely Von. Jaksch's Anæmia. The interesting point about the case was that the child had never been out of New York City. Anæmia was the most prominent symptom, the spleen also being enlarged considerably. At first no malarial parasites were detected, but later these became quite numerous in the blood and so gave the clue to the diagnosis. Quinine quickly caused the temperature to drop and ultimately produced a perfect cure.

Annotations.

The Pathological Anatomy of Pneumonic Plague.—In the Sei-I-kwai *Medical Journal*, Tokyo, January 10, 1912, Professor Fujinami, together with his fellow-workers, Drs. Otsuki, Murata, and Narabayashi, publish a preliminary report on the pathological anatomy of pulmonary plague in Manchuria.

The most marked changes in the Manchurian cases, the authors state, were shown in the lungs, and there was no doubt, from the clinical as well as from the pathological anatomical side, that pulmonary plague was the form present.

The pathological anatomical picture of the lungs varied according to the stages of the illness, and also to the ways and means by which it had developed. Generally the lungs were rich in blood, and looked dark-red and more or less œdematous. The hepatization peculiar to the plague generally spread itself over a greater part of a pulmonary lobe and looked most frequently dark-red, grayish dark-red or grayish yellow-red, seldom it looked yellowish gray. The hepatized portion of lung was raised and felt hard, but was not generally very compact. Its cut surface was not so finely granular as in the case of genuine croupous pneumonia. It was always noticed that, beside the widespread hepatizations, there were at times a few small lobular hepatizations or infiltrations. There were some cases which did not show any well-formed and localized hepatizatized area, but the whole cut surface of the lung looked almost uniformly dark-red and the real hepatization had not yet developed. The situation of hepatization was not constant, and any one of the lobes could be affected.

The disease was seen mostly in the right upper lobe, and nearly as frequently in the left upper and lower lobes, as in the right lower lobe. Only in one case was the chief seat of marked hepatization in the right middle lobe.

Lungs: Microscopically the congestion of the pulmonary blood-vessels and capillaries was very marked. The alveoli of the hepatized area contained numerous leucocytes, and besides them, serous fluid, extravasated blood corpuscles and shed-out epithelium in various quantities. Fibrin was seldom or hardly ever recognized in the contents of the alveoli. The unhepatized alveoli were either empty or only filled with œdematous fluid which contained leucocytes here and there. The plague bacilli were seen accumulated in enormous number in the alveoli, and formed an essential part of the alveolar contents. They were present not only inside the hepatized areas, but also where there was no inflammatory cellular exudation. What appeared peculiar was the thick accumulation of plague bacilli round the blood-vessels and bronchial walls of the lung (in the perivascular and peribronchial lymphatics); equally remarkable was the presence of an enormous quantity of plague bacillus under the pleura. Isolated plague bacilli

or small colonies of these were also recognized inside the blood-vessels. Micrococci, diplococci and bacilli of other species were seen occasionally in the pulmonary tissues beside the plague bacillus.

Pleura: In most cases the pleural surface was covered with fibrinous-looking deposits of various extensions. This was particularly well marked over the hepatized area. The plague bacilli were also present in large numbers in the pleural deposit. The sero-hæmorrhagic exudate was sometimes seen in the pleural cavities.

The bronchial, tracheal, and laryngeal mucous membranes were dark red, somewhat swollen and covered with reddish frothy mucous masses.

The bronchial lymphatic glands were generally more or less enlarged; in some cases fairly considerably and in others nearly normal in size. They were always rich in blood and dark red in colour. The cut surface appeared somewhat swollen. The lymph channels of the lymphatic glands were filled with thick masses of the plague bacilli and consequently appeared to penetrate deeply into the follicles. The bacilli appeared generally in small numbers in the parts of the lymphatic glands where the deposit of carbon pigment was particularly large.

The red blood corpuscles were seen frequently in the neighbourhood of the over-filled blood vessels extravasating into the lymph channels. Sometimes necrosis occurred in the parts of the lymphatic glands which were filled with bacterial masses. In certain cases many bronchial lymphatic glands showed no noteworthy changes in structure except an enormous accumulation of bacteria.

The spleen was mostly enlarged to a greater or smaller extent but usually not very marked. The pulp was slightly swollen and generally rich in cells and blood; microscopically hæmorrhages could often be recognized.

The plague bacilli were particularly numerous in the pulp; they often formed a wall-like accumulation round the follicles, while the inside of the follicle was generally free from the bacteria or contained a relatively small number of them as in the case of the lymph glands.

The blood: In the blood-vessels and heart the blood was dark—blackish red and mostly thick in consistency. Bacilli were always present.

Heart: The right auricle and ventricle were largely filled in most cases with blackish red, thick (almost half coagulated) blood. Thrombosed masses occurred at times. The left auricle and ventricle also contained blood of the same quality. The right ventricle showed slight dilatation at times, especially in the conus arteriosus. The cardiac muscle looked cloudy and numerous fine fatty particles were seen in the muscular fibres (Sudan staining), which often showed fragmentation.

Liver and kidneys: These organs were rich in blood, the cells were cloudy and slightly swollen. The bacilli were seen in the blood vessels, and were especially numerous in the liver. The parenchymatous cells were filled with fat drops (Sudan staining).

The pharynx: The mucous membrane of the pharynx and nasopharynx generally looked dark red and slightly swollen. The dark-red coloration was, as a rule, fairly sharply defined from the œsophagus. Only one case showed serous infiltration and hæmorrhage of the submucosa of the pharynx.

The tonsils were red and almost hyperplastic. In most cases the plague bacilli were relatively few in the tonsils, and no marked necrosis and hæmorrhage was present in the latter. Numerous bacilli, necrosis and hæmorrhage were found in the tonsils of the case that showed serous infiltration and hæmorrhage in the pharynx. In this case the right tonsil was covered with a dirty grayish white deposit and the lingual tonsils were more or less swollen.

Œsophagus: Its mucous membrane was smooth and rather pale or pale red.

Stomach: Its mucous membrane looked swollen and cloudy. In two cases the mucous membrane was covered with numerous miliary hæmorrhages (erosions or very small ulcers). There were besides two cases of circular gastric ulcer; one was without doubt of old date (Otsuki), and must have been there before the illness started, but the other looked still fresh and the question whether it was due to plague or not must be left open.

Intestines: Their mucous membrane was red or pale. The follicles were not changed, but occasionally hyperplastic. Ulcers were not found and submucous hæmorrhages seldom occurred.

Pancreas: No marked changes were found.

The ureter, bladder and genital organs with their appendages showed no marked anatomical changes except occasionally hæmorrhages.

The suprarenals and thyroid gland were rich in blood, but exhibited no substantial changes.

Lymphatic glands: Excluding the bronchial lymphatic glands already discussed, the lymphatic glands showed no noteworthy enlargement, but occasionally various lymphatic glands (for instance, mesenteric and mediastinal glands) showed a small degree of hyperplasia without any necrosis or hæmorrhage. In one case which was an exception among the observed cases, many glands of the neck were distinctly swollen and hæmorrhages were present on their cut surfaces.

The lymphatic glands far from the primary lesions sometimes contained numerous bacteria in their lymph channels without showing any abnormality.

The brain and spinal cord: The central nervous system showed no particular coarse anatomical changes. The pia mater was hyperæmic, and at times slightly cloudy and œdematous.

In two cases Otsuki observed a fresh fibrinous hæmorrhagic exudation in the peritoneum.

Hæmorrhages: Punctiform or spotted hæmorrhages were very often seen in many parts of the body besides the hæmorrhages in deeply affected organs. Further hæmorrhages of a larger extent also occurred and were most frequent in the subserosa, peri and epicardium, pleura and at times peritoneum; more seldom and mostly in lesser degree in the mucous membrane of the stomach, intestines, œsophagus, bladder, ureter, trachea and

larynx, &c., and besides these in various parts of the body, namely in the chest muscles, retro-peritoneal and mediastinal connective tissue, connective tissue between the bladder and symphysis pubis, spermatic cord, and broad ligament, &c. Subendocardial hæmorrhages in the mitral valves and ventricular walls, and also multiple cutaneous hæmorrhages were also observed.

The occurrence of the plague bacillus in various organs: The enormous accumulation of plague bacilli in the lungs and peribronchial lymphatic glands and naturally in the sputum also has already been mentioned. Frequently the bacilli were present in large numbers in other lymphatic glands also. The spleen and liver also contained large numbers of the bacilli (especially in the blood vessels).

The plague bacillus was constantly found in the blood, but mostly in smaller numbers: Finally the authors state that the plague bacillus was present in almost all parts of the body, which might not even show any anatomical changes. It was present usually in small number in the kidneys, parotid gland, hypophysis, testicle and pancreas, while the tonsils contained in most cases a few bacilli. The urine contained a few bacilli and the pleural contents a large number. The peritoneal exudate likewise contained the bacilli. Beside these sites the bacilli were found in the nasal and pharyngeal secretions, gastric contents, fæces and in the bone marrow, &c. In two cases the cerebro-spinal fluid and bile contained no bacillus.

The above autopsy and pathological notes show how carefully the Japanese Commission must have studied the subject, and we have therefore given their results in considerable detail as they should prove extremely useful for others working at the same subject.

The Vaccine Treatment of Typhoid Fever.—Sir David Semple, writing in the *Journal of Vaccine Therapy* for February, 1912, on the vaccine treatment of typhoid, concludes:—

(1) That the treatment of typhoid fever by means of vaccines rests on a sound theoretical basis, as proved by the increase of protective substances in the blood of patients undergoing treatment.

(2) That if any reliance can be placed upon a limited collection of figures, vaccine therapy treatment is a practical method by which the death-rate can be lowered, relapses diminished, and complications in typhoid fever lessened.

(3) That the treatment is devoid of all risks, and can be easily carried out and to the best advantage by any physician with a knowledge of bacteriology, and the leading facts connected with immunization. Further, a knowledge of the blood changes which take place during bacterial infections and the result of the injections of bacterial vaccines is of importance; and finally a knowledge of the methods employed in measuring the protective substances in the blood.

(4) That the results already achieved indicate that it is a method of treatment worthy of the serious attention of those who are called upon to treat typhoid fever.

The Human Trypanosome of Rhodesia.—Bagshawe, in the *Sleeping Sickness Bulletin* issued March 7, 1912, refers to a paper "On the Human Trypanosome of Rhodesia (*Trypanosoma rhodesiense*)," by J. W. W. Stephens and H. B. Fantham, which appeared recently in the *Journal of Pathology and Bacteriology* (1912, January, xvi, No. 3, pp. 407-408). Stephens and Fantham give the following as additional evidence that the trypanosome described by them is new:—

"(1) The case came from a region in North-East Rhodesia where no *Glossina palpalis* is known, but where *G. morsitans* abounds, and the patient also passed through a region where *G. fusca* is found. This difference of carrier (probably *G. morsitans*) also supports the view that the trypanosome is a new species.

"(2) The pathogenicity of the trypanosome is distinctly more virulent than any strain of *T. gambiense* yet described, as has been pointed out by Yorke and by one of us (H. B. Fantham) with J. G. Thomson.

"(3) It has also been shown that *T. rhodesiense* produces well-marked œdema in the face of sheep, a condition which has not so far been recorded in the case of *T. gambiense*.

"(4) It produces keratitis in dogs, while *T. gambiense* does not.

"(5) Already a case of sleeping sickness has occurred in Nyasaland in which *T. rhodesiense*, with its morphological peculiarity, has been found.

"(6) We have carefully measured one thousand specimens of *T. rhodesiense*, and we have constructed a curve which differs distinctly from Bruce's curve of *T. gambiense*.

"(7) Action of human serum on *T. gambiense* and *T. rhodesiense*. Mesnil and Ringenbach (1911) have shown that human serum mixed with a dose of *T. rhodesiense* (which infects control animals in twenty-four hours) generally completely *prevents infection* in mice; whereas human serum mixed with *T. gambiense* (although it is less virulent than *T. rhodesiense*) has no *preventive or curative action* whatsoever.

"(8) *Trypanolysis.*—Mesnil and Ringenbach have also shown that the sera of animals (man, monkey, guinea-pig, &c.) infected with *T. gambiense* are trypanolytic for the homologous trypanosome, *i.e.*, *T. gambiense*, but have no action on the heterologous trypanosome, *i.e.*, *T. rhodesiense*.

"(9) Kinghorn has recently telegraphed that he has succeeded in transmitting *T. rhodesiense* by *G. morsitans*."

Proof is certainly accumulating that the trypanosome of Nyasaland and Rhodesia is different from that of Uganda, the Congo, and elsewhere, and it will be interesting to hear what Sir David Bruce and his co-workers have to say about it. Being on the spot, they are in the most favourable position

to judge, and reports from them should soon be reaching England now.

The Transmission of Human Trypanosomes by Glossina morsitans.—The long-awaited interim report of the Luangwa Sleeping Sickness Commission of the British South Africa Company is now to hand, and many points of the very greatest importance are embodied in it. Kinghorn and Yorke publish this report in the *Annals of Tropical Medicine and Parasitology*, vol. vi., No. 1, March 29, 1912. The title of the paper is "On the Transmission of Human Trypanosomes by *Glossina morsitans*, and on the Occurrence of Human Trypanosomes in Game." The summary of the author's conclusions is as follows: (1) The human trypanosome in the Luangwa valley is transmitted by *G. morsitans* (Westw.): (2) approximately 5 per cent. (4·76) of the flies may become permanently infected and capable of transmitting the virus; (3) the period which elapses between the infecting feed of the flies and the date on which they become infective is approximately fourteen days; (4) an infected fly retains the power of transmitting the disease during its life, and is infective at each meal; (5) mechanical transmission does not occur if a period of twenty-four hours has elapsed since the infecting meal; (6) some evidence exists to show that in the interval between the infecting feed and the date on which transmission becomes possible the parasites found in the flies are non-infective; (7) *G. morsitans*, in nature, has been found to transmit the human trypanosome; (8) certain species of buck, viz., waterbuck, hartebeest, mpala, and warthog, have been found to be infected with the human trypanosome; (9) a native dog has been found to be infected with the human trypanosome. These results, as already stated, are pregnant with importance, and further reports by the investigators will be eagerly awaited by all, both in Rhodesia and at home.

"Bulletin de la Société de Pathologie Exotique," tome v, 1912, No. 2.

The Microbiology of Elephantiasis.—Edmond Sergent describes two cases of elephantiasis in which he made a bacteriological examination. In both cases a pure culture of a very small streptococcus was obtained. Two monkeys inoculated with the germ died, one after 13 days, the other after 29 days, showing the same pathological lesions, viz., nothing at the point of inoculation, but small miliary abscesses in the kidneys, liver, spleen, and lungs. Examinations for filariæ in the second case gave negative results.

"Archiv für Schiffs- und Tropen-Hygiene," Bd. 16. 1912, Heft 5.

Relapsing Fever in connection with Malaria.—Schneider contributes a paper on recurring fever occurring with malaria in North Syria. In the hospital at Adana there were 13 cases of relapsing fever and 22 of malaria in May, 1911; in July 10 relapsing fever cases and 93 of malaria; while in August the relapsing fever cases fell to nil, the malarial cases, on the other hand, rising still further to the high figure of 161. The latter disease seems to be very prevalent around Adana.

Abstract.

BERI-BERI:

With a Suggestion for Governmental Aid in its Eradication.*

By Victor G. Heiser, M.D.
Manila, P.I.

Dr. Heiser said that the various phases of the beri-beri question had been so extensively reported upon during the past few years, that it was with considerable hesitation that he presented any remarks on this subject to an audience that was so well versed in the recent developments in connection with this disease. Taking it for granted that there was now sufficient proof available that beri-beri in the Orient occurred most frequently among those whose staple article of diet was polished rice, it was thought that perhaps it might be of interest to present some of the steps they had taken and the experiences they had had in the Philippines in attempting to bring about the general use of unpolished or undermilled rice.

In the first place, in order that there might be a standard as to what constituted polished or unpolished, or overmilled or undermilled rice, Dr. Aron, of the College of Medicine and Surgery of the University of the Philippines, undertook a series of experiments on chickens, as a result of which he came to the conclusion that any rice which contained ·4 of 1 per cent. of phosphorus pentoxide or more might be regarded as undermilled rice, and therefore safe as a staple article of diet, and any rice that contained less than this percentage of phosphorus pentoxide should be regarded as overmilled rice, and therefore unsafe as a staple article of diet. From recent experiments it appears that potassium or other substances found on the outer portion of the rice grain might be used equally well as an index of the degree of polishing.

In spite of the remarkable success in reducing the number of beri-beri cases that occurred in the military and civil establishments in the Philippines soon after the use of undermilled rice was made compulsory, it early became apparent that only by the most urgent insistence could its continuous use in even such circles be brought about. Many of the more ignorant believed that on account of the darker colour of the unpolished rice the Government was trying to force a cheap and inferior article upon them. Commissary officers, prison wardens, captains of vessels, and others directly charged with carrying out the orders to use undermilled rice, were constantly besieged with complaints. It was but natural that they should take the course of least resistance and recommend that its use be discontinued. During the early period of the introduction of unpolished rice there was undoubtedly some cause for complaint owing to the fact that the rice mills were slow in adjusting their

* A paper read at the Second Biennial Congress of the Far Eastern Association of Tropical Medicine at Hong Kong, January 22, 1912.

process of manufacture so as to produce rice that was well cleaned and only sufficiently polished so that the P_2O_5 did not fall below ·4 of 1 per cent. These difficulties were gradually overcome, but in spite of that much prejudice still remained. Considerable effort had been made in the way of education. Public lectures had been given, instruction in the schools had been undertaken, and the daily and weekly newspapers frequently contained articles upon the cause of the disease and how to prevent it. Since it had been so difficult to bring about the use of unpolished rice among persons for whom the Government furnished the rations and whom it was possible to reach so directly by education, it was apparent that at best the adoption of unpolished rice by the masses would necessarily be slow.

Legal opinion was quite favourable to the idea that, under the provisions of the food laws in force in the Philippines, the sale of polished rice might be prohibited. Whether it would be advisable to attack the problem from that standpoint was, however, very questionable. The enforcement of such a law would be almost sure to incur the passive opposition of even those persons who used the European diet, and to prevent such persons from purchasing polished rice would not be of any assistance whatever in reducing beri-beri, and at the same time the sanitarian would deprive himself of the very aid of those members of the community upon whom he must necessarily depend to assist him in disseminating the information among the masses that polished rice causes beri-beri among those who used it as a staple article of diet.

At first it was thought that the most effective way of insuring the use of unpolished rice would be to prohibit the manufacture of polished rice, but that procedure was also open to the objection that it would prevent the use of polished rice amongst those whom it did not harm.

Another plan suggested was the imposition of a licence fee upon both retail and wholesale dealers who sold polished rice and the making of the fee sufficiently large so that the cost of polished rice would be beyond the reach of the masses; but this method would probably have required an enormous amount of supervision for its successful enforcement.

The conclusion ultimately reached was that the object sought could probably be most successfully attained by placing a tax of say 5 centavos (approximately 5 cents Mexican) per kilo upon every kilo of rice that is polished, and no tax upon unpolished rice. The standard by which a rice is to be judged should be definitely fixed by law, and can be well based upon the amount of phosphorus pentoxide which it contains; in other words, a rice that contained ·4 of 1 per cent. of phosphorus pentoxide or more would be regarded as an unpolished rice, and rice that contained less would be regarded as polished rice. Such a standard would be very simple of application, and would not be likely to cause serious misunderstandings. It would also have the additional advantage of providing definite testimony with which to go before the courts in the event that judicial action became necessary. In view of the fact that the quantity of rice consumed by those who use the European diet is merely nominal, such a tax placed upon polished rice would scarcely be felt by them, and would not be likely to result in any opposition, whereas the masses would almost be compelled to purchase the untaxed rice. Such a law would cause no hardship, and at the same time would provide a final and conclusive test of the correctness or the incorrectness of the predominating view with regard to the etiology of beri-beri. It was also capable of being effectively and economically enforced.

It was the intention, Dr. Heiser said, to place such a law in force in the Philippine Islands during the present year, but owing to the shortage of the rice crop and the general disturbance of the market which resulted therefrom, it had not been deemed expedient to attempt it as yet.

This plan seemed so feasible, however, to Dr. Heiser, that he desired to recommend to the Association that a suitable resolution be drafted for the purpose of bringing it to the attention of the Governments in the Orient. He believed that such a measure would be entirely practicable, and would be almost sure to result in an enormous reduction in the beri-beri mortality and morbidity in a few years' time, and it was not too much to hope that the disease might by such means be entirely eradicated in the near future.

Report.

"AN OLD REPORT ON YELLOW FEVER"

THROUGH the courtesy of the Registrar of Records for the Department of Health for the City of New York, we have received a copy of a report on yellow fever made as long ago as June 1, 1870, by Dr. J. C. Nott, Special Inspector on Yellow Fever.

There are many points of interest in the report, but the part dealing with the cause of the disease is especially so, as it comes very near the since established fact of the part the mosquito plays in the conveyance of that disease. The following are Dr. Nott's ideas on the cause of yellow fever:—

CAUSE OF YELLOW FEVER.

"The cause of yellow fever, like those of other zymotic diseases, is unknown, but I think it can be pinned down into narrower limits than the cause of any other epidemic disease, and by the law of exclusion we can remove from this some of the difficulties which surround both contagious and malarial fevers. But it must be confessed that, though we may be able to say what it is not, we are yet far from knowing what it is.

"Yellow fever cannot be an effect of effluvia emanating from decomposition or molecular changes in organic matter, nor can it find its cause in floating vegetable germs, for the plain reason that it does not operate through the air. If the materies morbi existed in the form of gaseous emanations or atmospheric spores, it would obey the laws of gases and be scattered by the winds over town and country in a few hours. But

this is not the case; it will travel through a town step by step, from house to house, for a month or six weeks, uninfluenced in the slightest degree by winds blowing alternately from all points of the compass. In New York, Philadelphia, and other northern cities the disease always commences near the shipping, and travels in the most gradual manner, taking several weeks to extend over a very small portion of a town from its point of departure. So gradual was its progress in the epidemic in New York in 1882, that the Board of Health placed a fence around it in Rector Street. The disease extended from house to house, and the Board, watching its progress, extended the enclosure every few days to keep persons out of the infected district. Mr. Isaac Bell, father of Honourable Isaac Bell, of New York, President of Commissioners of Public Charities, then a member of the Board, and a man proverbial for his good sense and veracity, informed me some years ago, that the Board of Health, on that occasion, made a calculation that the yellow fever travelled 40 ft. a day. No man familiar with yellow fever will at all discredit this statement. While I was living in Mobile, yellow fever prevailed in the two successive years, 1842 and 1843. In the first year it commenced in Spanish alley, in the southern part of the city, and took six weeks to overrun one-half the town, or all that part south of Dauphin Street which divides the town into two pretty equal parts, as Broadway does New York. I saw no case originating north of Dauphin Street that year, although it attacked almost every house on the south. It would doubtless have gone over the entire town had it not been arrested by frost. The next year the disease commenced in the northern extreme of the town, near Gliddon's blacksmith shop, and swept all over the town left untouched by the previous year. Each year it took its half of the town more deliberately than the army worm would eat through a cotton field.

"The yellow fever on Governor's Island last summer travelled in the same deliberate manner, spreading gradually from house to house, and not reaching its acme before the eighth week. I have just been looking over the Surgeon-General's report of the yellow fever epidemic of 1867 along the gulf of Mexico (kindly sent me by Surgeon-General Barnes), and I find that gradual progression characterized it in every instance. As remarked by Dr. Warren Stone, of New Orleans (who has seen more of this disease than any man on this continent), it will often travel, like a tax collector, from house to house, along a street, for two or three weeks before it diverges. So constant is this mode of gradual progression, that when the disease is prevailing in one part of a town at the South, physicians advise persons to flee from other parts to the country to escape it, a month after its first appearance, and such advice is given in perfect confidence.

"If, then, the atmospheric causes to which I have alluded are without facts to sustain them, we must seek some other explanation more in accordance with the well-known habits of yellow fever.

"*Insect Hypothesis.*—The only hypothesis which, in our present state of knowledge, has any plausible support, and which may assist in directing our future researches, is that which supposes the agency of some minute insect or other organic form, animal or vegetable, possessing the powers of self-propagation and locomotion, and which, from its deliberate mode of progression, in spite of calms, or winds from all points of the compass, would seem to travel upon the ground, where it will be found by the microscopist, if ever detected.*

"We have abundant authority to show that yellow fever is most active in its operation near the surface of the earth. It attacks persons in a larger proportion on a ground floor than on the stories above, and the immunity increases as we ascend in a house. This was well established by Ferguson and others in the West Indies; and in Charleston, South Carolina, in former years, when the disease was more common in that city, it was the custom to send children into the third story, and keep them there during the whole epidemic. It is killed, like insects and plants, by a temperature of 32° F. It is more active at night than in the day, as is the case with insects of various kinds. Like insects, it is erratic as to its points of attack, appearing at points here and there in the most unaccountable way. It may attack the inmates of a single house—of a single block—of a ward in a town; it may ravage one-half of a city or sweep over the whole, leaving here and there an untouched spot, as insects do in a cotton or grain field. In 1853, during that terrible epidemic in Mobile, there was a Mrs. McKnight, a mantua maker, who had thirteen unacclimatized sewing-girls in her establishment that passed through the entire epidemic without missing a meal from sickness, and I could have stood on the top of her house and thrown stones against others, north, south, east and west, in which persons were dying with black vomit. Yellow fever has been known to attack all the sailors in the berths on one side of a man-of-war before reaching one on the opposite side. It has been stopped by a moat and ditch, by the walls of prisons (as the Calaboose, in New Orleans), and we shall see, further on, that in 1856, on Governor's Island, it was arrested by a thin board partition in 'Rotten Row.' It occurs, too, unlike marsh fevers, at irregular periods of several or many years, as many insects do, the germ lying dormant and waiting for its exciting cause. If we examine the history of our cotton plant, of wheat, rye, oats, barley, the Irish potato, the vine, and other plants, we find that they too are subject to other epidemics, all of which occur in this partial and erratic manner, and all of which are distinctly traceable to insect or vegetable fungi. The analogies furnished by various forms of insects are very curious and suggestive. The locust will appear at long intervals, and sometimes in such immense swarms as to darken the rays of the sun. The same fact is seen in connection with certain gnats. One female termite ant will produce a progeny of 40,000. The aphidæ are bred by millions in a few days; and out of the half a million of insect species now described

* An infected vessel would be the best place for microscopic investigations, as we are certain of its presence here in an intense form, from the fact that the disease is readily taken by all who visit such vessels.

by entomologists, we have endless analogies to enlighten us on the erratic habits of epidemics. Yellow fever is, *par excellence*, a disease of towns or crowded populations, and when a town is built on malarious grounds the marsh fevers (in the yellow fever zone) are gradually driven from the town, while they still infest the surrounding country. Charleston, South Carolina, affords a familiar example. The marshy lands around this city for many miles are among the sickliest on our continent, being almost uninhabitable on account of what they call 'country fever,' a high grade of bilious fever. The city stands upon a part of this sickly region where they now no longer have the marsh malaria fevers, but yellow fever takes their place. Such is everywhere the history of yellow fever. It is a disease of crowded populations—not of rural districts. The same law applies to plants. Whenever you multiply the growth of any plant, as cotton, grain, the vine, the potato, &c., it becomes subject to new diseases and to great epidemics; in other words, to the attacks of parasites. Yellow fever was unknown in New Orleans previous to 1796, since which time that city has never been a year without it, either in sporadic or epidemic form. Previous to about the year 1830 the cotton plant was so free from diseases that the planters never took these into consideration in considering the chances of failure in the crop. He was certain to make more cotton than his labourers could gather, unless storms of frosts interfered. But of late years, since the growth of cotton has greatly increased and plantations been brought near together, the planter looks with dread to the coming of the bole-worm, the army-worm, the rust, the sore skin, and other insect or epidemic diseases which may injure or totally destroy his crop.

"Like yellow fever, these insects come at irregular intervals—sometimes in successive years and at others after an interval of several or many years. Sometimes, like yellow fever, they will eat up a large or small spot here and there, the half of a crop, or sweep like a pestilence over a hundred-acre field, leaving perhaps only a green spot here and there. These insects then march on, like yellow fever, from south to north, skipping here and there in the most irregular and erratic way.

"The diseases of our small grain, the potato rot, the disease of the vine, &c., all show analogies of the same kind. Dr. Beale, who has studied with much care the germ theory, says: 'Of microscopic fungi and algæ there are many different kinds which grow and multiply under very different external conditions, and live upon different kinds of food. Thus there are germs of numerous different species diffused through the air and wafted long distances at different seasons; some flourish at a temperature which would be fatal to others; some live on vegetable, some on animal matters; some require solid substances upon and into which they may grow, while others seem to obtain from the atmosphere alone' (as yellow fever germs seem to do) 'all the material for their growth and development. . . . Some enjoy light, while others vegetate freely in the dark. . . . They remain so quiescent for months (or years) that no one would believe that their germs were in existence; but in a night the air or water of a district may become peopled with countless multitudes of beings, not one of which was to be found a few hours previously.'

"It is well known that the eggs of many insects, like the seeds of plants, may retain their vitality for years, and some of the infusoria, as the rotifers, &c., may be exposed for months to a tropical sun, and become as dry as the sands of Africa, and yet be resuscitated by the application of moisture.

"Although the microscope, during the last half century, has furnished an immense amount of curious information in relation to zoöphytes, our knowledge of these organisms is still so imperfect that Mr. Agassiz and other naturalists have excluded them from their classifications of the animal kingdom. Infusoria from the larvæ, onwards, pass through such varied forms and stages of development, that it is impossible to trace many of them from their origin through their line of descent, and consequently to fix genera and species.

"Almost as great mystery surrounds the natural history of Cryptogamia. The difficulty, perhaps, arises mainly from the imperfection of our microscopes; and this is one that may never be overcome, as we are seeking to penetrate infinity. Every improvement in the telescope brings to view new worlds and new wonders in the heavens, and still but a step is made in illimitable space. Every new power added to the microscope brings to light more minute living molecules than any known before, and yet the imagination can place no bounds to the divisibility of matter, organic or inorganic.

"It is possible that even insects may exists a million times smaller than any the microscope has yet reached.

"While the slow and steady progression of yellow fever from a point, as I have described it, should be received as an indisputable fact, on the other hand we confess that the fact is at present inexplicable; it must be some form of living organism, which multiplies and extends by organic laws. If in insect form, it is easy to understand its progress, and, if a fungus, we are not without examples in the larger fungi of a manner of progression from a given spot more rapid than that of yellow fever. Moreover, it is the business of some insects to distribute certain seeds of plants far and wide; to carry the pollen of one plant to another to fructify it; and it may be the duty of others to disseminate diseases. It is well known, on the authority of Murchison and others, that the malignant pustule is taken by gnats from an animal and communicated to man by its bite. So there are many ways that diseases might be carried and communicated by insects or fungi. I will here mention a fact which I have often noticed myself with regard to mosquitoes, but have never seen it alluded to by others. These insects are so abundant in Mobile, New Orleans and other Southern cities, that it is impossible to sleep at night without the protection of mosquito nets. Fair-skinned persons from more northern climates, and particularly young children recently introduced, suffer greatly from the bites of this insect, the bites often inflaming, and even making

tedious, troublesome sores; whereas the children of parents who have lived a generation or two in the climate suffer comparatively little—they seem to become acclimatized against the poison of these insects as they do against the poison of yellow fever. On rising from my own bed in the morning I have many times seen my little children lying in a trundle-bed covered by mosquitoes, after, as Mrs. Jackson said, "kicking the kiver off." The insects had been biting at them for hours, and yet by breakfast-time every mark had disappeared. Such would not be the case with the children of fair-skinned parents recently brought into the climate. Some Southern children, it is true, are more susceptible to the poison of mosquitoes than others, and so it is with regard to susceptibility to yellow fever.

"In speaking of causes, I must say, that I have no belief in the *de novo* origin of yellow fever out of its proper zone, and I believe it is of rare occurrence even in the Tropics, if at all. All the imaginable causes that could have existed from 1793 to 1822 north of the Potomac have existed during the last fifty years without producing the disease. But let one of those big overflows of yellow fever come surging up from the Gulf, and overflowing Philadelphia, New York, Boston, and all the smaller intervening towns, as happened in former years, and you will see a germ left behind, here and there, that will spring into life from time to time, until, as certain other exotics, it dies out. The Newfoundland dog and the orange-tree may live for a succession of years in our Southern States, but sooner or later die out and must be replaced. So with yellow fever on our Atlantic coast."

Notes and News.

TROPICAL MEDICINE IN AUSTRALIA.—The *Australian Medical Gazette* (February 17, 1912) announces that the Commonwealth Government, after considering the application from the Australian Institute of Tropical Medicine for increased endowment and the resolutions of the last Session of Congress in connection therewith, has resolved to grant £4,000 per annum from January 1, 1912. This will permit the immediate erection of new laboratories, and the early appointment of an additional staff, so that the Institute may widen the scope of its work, and may undertake an organized inquiry into the various matters likely to affect the permanent establishment of a working white race in tropical Australia.

Notice.

THE UNIVERSITY OF LIVERPOOL.

EXAMINATION LISTS, APRIL, 1912.

Faculty of Medicine—Diploma in Tropical Medicine.

Aeria, J. R., Anderson, E. L., Borle, J., Bowie, J. T., Brassey, L. P., Christie, D., Dillon, H. de C., Kochhar, M. R., McGusty, V. W. T., Milne, A. J., Pelly, H. N., Prasad, B., Prentice, G., Ross, F., Russell, A. J. H., Ruthven, M. W., Sandilands, J.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"Journal of the Royal Army Medical Corps," No. 1, January, 1912, vol. xviii.

Kala-azar.—Leishman continues his critical review of kala-azar and Tropical sore, dealing specially with infantile kala-azar (*L. infantum*, Nicolle). In the present number of the above journal he gives a detailed account of the work accomplished by the Italian and other observers. Basile's experiments on the transmission of the disease by means of fleas are recorded. Those are very interesting. One of these closely imitating what might occur in nature was as follows: Two pups, born in the laboratory, when thirty days old were placed in a special cage which had been thoroughly disinfected, after having been proved to be free from kala-azar by examination of the bone marrow. The cage was protected by netting fine enough to ensure that no fleas or other parasites could gain entrance from outside, and the temperature was maintained at about 20° C. as the experiment took place in winter. After a few days a dog infected with the disease was placed in the same cage, so that there was no obstacle to its numerous fleas passing to the uninfected pups. Thirty days later, liver puncture of the two pups showed that each was infected, *Leishmania* parasites being found on microscopic investigation. Control pups, from the same litter, remained in good health and showed no infection. In another experiment Basile succeeded in infecting pups with fleas collected from Bordonaro, an endemic focus of the disease. Basile concludes from the result of his experiments and the rigorous conditions under which they were carried out, that they prove without dispute the fact of flea transmission.

"Transvaal Medical Journal," vol. vii, No. 7, February, 1912.

Human Spirochætosis.—Park Ross writes on human tick fever. He briefly reviews the work already done on the disease and gives interesting details of an investigation conducted by himself upon the disease in Northern Zululand. During 1910 Ross found five cases amongst the natives living there. One near Lake Sibia, one at Sordwana Bay, two at the Northern Lake Bangazi, and one at Ebomveni in Mywana's location, on the east side of Lake St. Lucia. The first and last named of these places are some 70 miles apart. The hill Zulu fears the Ornithodorus, the carrier of the spirochæte, very much and will not sleep in an infested hut. The disease, tick fever, exists throughout the whole of Portuguese East Africa and in parts of the Transvaal, so that its African distribution generally is seen to be a very wide one.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

THE BLOOD IN SPRUE.

By GEORGE C. LOW, M.A., M.D.

SPRUE, especially if it has lasted for any length of time, produces very definite changes in the blood, these changes being of the nature of a well-marked secondary anæmia. Castellani and Chalmers, in their "Manual of Tropical Medicine" (p. 948), state "that there is always some reduction of the red cells, which may fall as low as 3,000,000 to 1,000,000 per cubic millimetre. The colour index is low, and the structure of the cells is normal. The white cells are also reduced to about 6,000 to 2,800 per cubic millimetre. The ratio of white to red is about 1 to 400 in bad cases. A differential count shows an increase in the mononuclears and eosinophiles."

Within the last few years I have examined the blood of several cases of sprue in different stages of the disease, most of these patients having belonged to Sir Patrick Manson or Mr. Cantlie.

On the whole, I have found similar changes to those described above by Castellani and Chalmers, though in some minor details, such as the structure of the red cells, the colour index and the differential increase of the mononuclear and eosinophile cells, my results do not agree. Towards the termination of one case, the blood, especially as regards the poikilocytosis and some other details, became very much like pernicious anæmia in type, though ultimately it was decided that it was not this disease.

The following blood-counts illustrate the different points that one wishes to bring out. Of course, it entirely depends on what stage of the disease the patient is in when the examination is made, and so, early, medium and late cases should be studied for comparison.

CASE 1.—Mr. S., 39. A patient of Mr. Cantlie's. An early case of sprue, the disease having lasted on and off for several months. Just before his examination the patient had been treated by Mr. Cantlie by his own special method of treatment. Patient did not look anæmic.

BLOOD EXAMINATION.

Reds	4,420,000
Whites	7,200
Hæmoglobin	90 per cent.

DIFFERENTIAL LEUCOCYTE COUNT.

	Number of leucocytes counted.	Percentage.	Number of leucocytes per cubic millimetre of blood.
Polymorphonuclear	300	60	4,320
Large mononuclear	10	2	144
Lymphocytes	160	32	2,304
Eosinophile	12	2.4	172.8
Transitional	15	3	216
Mast-cells	3	.6	43.2
	500	100.0	7,200.0

Note on the General Appearances of the Blood.—Blood on the whole fairly good; there was, however, some irregularity in the size of the red cells, microcytes and megalocytes being present in a small percentage. Practically no poikilocytosis (irregularity in shape) present, and no cells with basophilic degeneration seen. No nucleated reds.

Examination for Parasites.—No malarial or other parasites present in blood.

CASE 2.—Mr. W., 56. A patient of Mr. Cantlie's. A chronic case of sprue, the disease having lasted for a considerable time. Patient looked anæmic, and was in a very feeble condition generally. Œdema of legs, &c.

BLOOD EXAMINATION.

Reds	3,890,000
Whites	9,200
Hæmoglobin	80 per cent.

DIFFERENTIAL LEUCOCYTE COUNT.

	Number of leucocytes counted.	Percentage.	Number of leucocytes per cubic millimetre of blood.
Polymorphonuclear	333	66.6	6,127.2
Large mononuclear	12	2.4	220.8
Lymphocytes	144	28.8	2,649.6
Eosinophile	4	.8	73.6
Transitional	7	1.4	128.8
Mast-cells	0	0	0
	500	100.0	9,200.0

Note on the General Appearances of the Blood.—The blood showed a well-marked poikilocytosis. Cocked-hat forms, sausage-shaped, &c. Great irregularity in size of the erythrocytes also present, many microcytes and megalocytes. A few polychromatophilic cells seen, and also a few reds with basophilic degeneration. One nucleated red, a normoblast, seen during the count of the 500 leucocytes.

Examination for Parasites.—No malarial or other parasites present in blood.

CASE 3.—Mr. G., 60. A patient of Mr. Cantlie's. A chronic case of sprue that had lasted off and on for 10 years. Patient looked distinctly anæmic.

BLOOD EXAMINATION.

Reds	2,590,000
Whites	6,600
Hæmoglobin	55 per cent.

DIFFERENTIAL LEUCOCYTE COUNT.

	Number of leucocytes counted.	Percentage.	Number of leucocytes per cubic millimetre of blood.
Polymorphonuclear	347	69.4	4,580.4
Large mononuclear	3	.6	39.6
Lymphocytes	130	26	1,716
Eosinophile	7	1.4	92.4
Transitional	10	2	132
Mast-cells	3	.6	39.6
	500	100.0	6,600.0

Note on the General Appearance of the Blood.—The blood showed a well-marked poikilocytosis of a less degree than that usually seen in pernicious anæmia, however. Irregularity in size of reds also marked—microcytes and megalocytes. Reds showing basophilic degeneration present, but no nucleated ones seen.

Examination for Parasites.—No malarial or other parasites seen.

CASE 4.—Mr. R., ? age. A patient of Sir Patrick Manson's. An old sprue case that had lasted for years. Towards the end patient seemed to have recovered from the sprue, but became more and more anæmic, and eventually died of asthenia.

BLOOD EXAMINATION.

First Count.

Reds	1,080,000
Whites	2,500
Hæmoglobin	30 per cent.

DIFFERENTIAL LEUCOCYTE COUNT.

	Number of leucocytes counted.	Percentage.	Number of leucocytes per cubic millimetre of blood.
Polymorphonuclear	320	64	1,600
Large mononuclear	10	2	50
Lymphocytes ..	155	31	775
Eosinophile ..	10	3	50
Transitional ..	5	1	25
Mast-cells	0	0	0
	500	100	2,500

Note on the General Appearance of the Blood.—Extreme poikilocytosis present. Cocked-hat forms, sausage-shaped, and other abnormally shaped reds abundant. Many microcytes and megalocytes. Polychromatophilic cells and reds which showed basophilic degeneration. One nucleated red, a normoblast, seen. Type of blood suspicious of pernicious anæmia.

Examination for Parasites.—No malarial parasites. No evidence of malaria present in the blood.

Second Count.

Reds	1,210,000
Whites	2,400
Hæmoglobin	30 per cent.

DIFFERENTIAL LEUCOCYTE COUNT.

	Number of leucocytes counted.	Percentage.	Number of leucocytes per cubic millimetre of blood.
Polymorphonuclear	214	71.4	1,713 6
Large mononuclear	4	1.3	31.2
Lymphocytes ..	70	23.3	559.2
Eosinophile ..	9	3	72
Transitional ..	3	1	24
Mast-cells	0	0	0
	300	100.0	2,400.0

Note on the General Appearance of the Blood.—Poikilocytosis was still very marked, but did not on the whole seem so extreme as when the blood was first counted. Many microcytes and megalocytes still, also reds with basophilic degeneration. Several polychromatophilic cells. No nucleated reds seen. No mast-cells. No relative increase in the lymphocytes. Type more unlike pernicious anæmia to-day.

An analysis of the counts given above show, then, that in the early stages of sprue there is little change in the blood either in the number of the cells or in their relations to each other, but that as the disease progresses, an anæmia of a typical secondary type begins to develop. With this development the white cells at first remain more or less normal, but then tend to decrease in number till a marked leucopenia may ultimately result. As regards the different varieties of white cells present, there does not appear to be any special disproportion of any given type, the lymphocytes (small lymphocytes) not becoming abnormally increased even in very advanced cases, such as Case 4. There was no differential increase of the large mononuclear cells or eosinophile cells in any of the cases counted by myself, and it is more than likely that any eosinophilia must indicate animal parasites or some other equally definite cause. Differentially, the leucocytes may be designated as normal.

With the progression of the disease, the size and shape of the erythrocytes becomes profoundly altered. Case 2 and Case 3, for example, furnished many microcytes and megalocytes, and both also showed a well-marked poikilocytosis, or irregularity in shape of the red cells. When such changes are found polychromatophilic cells and cells with basophilic degeneration are also not uncommon, while nucleated red cells, chiefly of the normoblast type, may be encountered. Nucleated erythrocytes are, however, not common even in the advanced cases, which closely resemble pernicious anæmia.

In severe cases, especially towards the termination of the disease, the blood picture, as already stated, may resemble very closely that of pernicious anæmia. Case 4 illustrates this well. In this case there was a poikilocytosis of a very advanced type, quite comparable with that of pernicious anæmia, and, in addition, the reds were very low, a marked leucopenia also being present. The hæmoglobin index was high, another point in favour of such a diagnosis, but relatively the lymphocytes were not so numerous as is usually found in that latter disease. That point, together with the history of the case, decided me against the diagnosis of true pernicious anæmia.

There is no very definite reason, of course, why pernicious anæmia should not follow on sprue, as the latter disease is chiefly associated with changes in the alimentary tract, but in all probability such cases as the one mentioned above are just severe secondary anæmias simulating the pernicious anæmia type, and not real idiopathic pernicious anæmia.

In the early cases, amelioration of the symptoms due to suitable treatment is followed by an improvement in the condition of the blood, and the blood examination should never be omitted when determining the progress of a case and its ultimate prognosis.

Nothing in any way resembling parasites were ever seen in the films of blood taken from the different cases. Leishman's method was used for staining the films, the usual technique being adopted.

ON "WINTER CASES" OF PELLAGRA.

By Professor CREIGHTON WELLMAN,

Head of the Department of Tropical Medicine and Hygiene, and Director of the Laboratories of Hygiene and Tropical Medicine, Medical Department, Tulane University of Louisiana, Visiting Physician to the Charity Hospital, New Orleans.

AND

DAVID HOYT SPARKS,

Interne, Charity Hospital, New Orleans.

(Studies from the Laboratory of Tropical Medicine under the Direction of Creighton Wellman, Medical Department, Tulane University of Louisiana—No. 13).

THE following cases are remarkable in that the marked skin lesions characteristic of pellagra were declared before the onset of warm weather and without exposure to sunshine.

CASE 1.—Mrs. S. McM., born in Louisiana, age 40, occupation housewife, admitted March 12, 1912.

Family History.—Father died at age of 45, from "dysentery," mother died at age of 40, from tuberculosis; three brothers, one dead from tuberculosis, the other two are in good health. One sister dead from tuberculosis; her father had been a drunkard, and her brothers now living drink whisky to excess.

Previous History of Patient.—Habits good, occupation is housework, has had the usual diseases of childhood except mumps, scarlet fever and diphtheria; denies venereal diseases. She claims she has always been a healthy woman except for a "female complaint" from which she says she has been suffering for seven years. Patient relates that after the birth of a child twelve years ago she began to suffer from "whites"—leucorrheal discharge—and also that about five years ago her external genitalia began to "itch her." She had malaria when a small girl. Her history is otherwise negative.

CASE 1.—Showing the emaciated condition of the patient and the eruption on the hands.

The present spring season in New Orleans is extremely tardy and, up to the date of admission of the patients here presented, no warm weather had prevailed, the patients developing an exacerbation of the disease during a typical southern winter season.

Present Illness.—Patient says that two years prior to admission she began to suffer from indigestion. This was in the month of January, 1910. This was at first a "fullness" in the epigastric region, and gas would accumulate in the intestines. The condition

gradually grew worse, and a month or so following she began vomiting. The vomiting lasted only one night but she was sick at her stomach for some time afterwards, and she has been losing weight and failing in appetite ever since. She also suffered from dysentery during about two months of this time. During this period the corners of her mouth were sore, but she did not notice any redness or discoloration of her skin at the time. There was no recurrence of this condition in January, 1911, nor in the following spring, but her general condition was still lowered. In January, 1912, her indigestion began to "worry" her very much, and this in just the same way it did two years previously. This condition has continued, with slight remissions, up to the present time. About ten days prior to admission (March 15), her mouth began to itch, and on the following day a papular eruption broke out on the inside of her mouth, which later became ulcerated and very sore. Three days later her bowels began to "worry" her very badly and about the same time she noticed a little discoloration on the back of her left hand. This spot became very red and seemed to spread gradually over the back of her hand. During this time she also noticed the other hand begin to get discoloured and turn red, and her genitals itched very much.

Patient's Diet.—She says that prior to two years ago she lived on corn bread (maize), milk and vegetables. She also reports that several times, while sifting her corn meal she noticed that it smelt musty and would throw it away or feed it to the chickens. She claims that she has not eaten very much corn bread during the last two years, but has eaten a lot of grits, canned corn, rice, cheese and meat. The patient insists that about one week before coming to the hospital she ate some canned corn (? spoiled) and it made her very sick.

Examination of Patient.—She is somewhat emaciated, very easily exhausted, exceedingly nervous, otherwise the general condition is negative. *Head*, negative with the exception of the lesions already noted in the mouth. These on inspection show a marked redness of the lips, buccal cavities and tongue with areas of superficial ulceration. *Chest:* Lungs negative; heart shows a slight murmur, heard at apex and transmitted to the left, otherwise negative. *Abdomen:* Negative. *Vaginal Examination:* marked vaginitis, also a *prolapsus uteri* of the second degree with a small laceration of the cervix. *Urine* and *fæces* examination both negative. *Blood:* hæmoglobin percentage eighty. Differential leucocyte count: Large mononuclears, 4 per cent.; small mononuclears, 13 per cent.; polymorphonuclears, 80 per cent.; eosinophiles, 2 per cent.; basophiles, 1 per cent.

CASE 2.—Mrs. J. J., born in Louisiana, aged 21; admitted March 2, 1912.

Family History.—Father, mother, brothers and sisters all living and in good health.

Previous History of Patient.—Good habits, occupation housework; has had the usual diseases of childhood, otherwise has always been healthy. She denies venereal diseases.

Present Illness.—Patient says that after the birth of her first child four years ago, she began to suffer from dysentery, and also developed a skin eruption on her hands and neck. Prior to this time she had been eating some corn bread. She states that this condition troubled her during the winter time, and as spring and summer approached she would get better. She also claims that at first the lesions on her hands and neck disappeared for a time under treatment by her physician. Following the birth of her last child, eight months ago, the lesions reappeared on her hands and neck, and a severe dysentery began which grew worse. She is having an average of ten stools per day now. The character of these stools is similar to those seen in amœbic dysentery (blood and mucus).

Examination of Patient.—Apart from the emaciation and the skin lesions on the hands and neck, the physical examination is negative. Examination of *fæces* and *urine*, negative. *Blood*, negative apart from 3 per cent. of eosinophiles and a low hæmoglobin percentage.

CASE 3.—This case was seen in the clinic of Dr. Howard D. King, who has kindly given the present writers the following notes on it. The case occurred in December, 1911, and the patient was a woman aged 32, a native of East Baton Rouge Parish, Louisiana. She gave a history of having eaten a great deal of corn bread three times a day, and also much salt pork. She presented all the usual gastro-intestinal symptoms of pellagra, the disease seeming to be in an unusually acute stage. The mouth lesions were characteristic and very severe. The eruption was well marked about the neck, wrists, elbows and ankles. The patient also showed mental symptoms, including lapses of memory.

We have heard of several other "winter cases" of pellagra occurring in New Orleans during the past winter and intend to secure further records of such if possible.

Throughout the literature are occasional reports of cases of pellagra persisting through a winter season, and rarely we find some passing notice of the onset of an attack occurring in the winter, but the matter of what we have called "winter cases" of this disease has not received much attention at the hands of writers on the subject. We have therefore presented the above eases in order to emphasize the fact that in the United States the affection occurs in the winter as well as in the summer. While it is true that the larger number of cases are seen in the summer and give a history of prolonged exposure to the sun's rays, yet it would seem that when the dose of pellagra toxin is large enough, all the symptoms may promptly declare themselves at any time of the year and under almost any circumstances.

In conclusion, the writers would acknowledge their indebtedness to Dr. S. M. Stafford, in whose service Cases 1 and 2 occurred; to Dr. O. L. Pothier, Pathologist of Charity Hospital, for the photograph of Case 1; to Dr. H. D. King for his notes on Case 3; and to Mr. J. G. Hirsch for information regarding Case 2.

NEPHRITIS AND QUARTAN FEVER.

By J. Tertius Clarke, M.R.C.S.Eng., L.R.C.P.Lond., D.P.H.Camb.

Health Officer, Perak South, Federated Malay States.

THE fact that temporary albuminuria may occur in malarial fever is mentioned in perhaps every medical text-book, but no stress is laid on the point. Albumin occurs in many febrile states, and most of the authors seem to mention it as being present in malarial fevers in the same way that it might occur in any other case of fever.

Much work has been done with regard to malarial fever, but nowhere is the suggestion made that the occurrence of œdema with albuminuria is a reason for suspecting the presence of one particular variety of the malarial parasite; yet I believe that the occurrence of an œdema in the Tropics of such a nature as to make one think of a parenchymatous nephritis is a reason for making a search for quartan malarial parasites imperative, and this is a conclusion which has been forced upon me by the observations of many years.

Thayer, in Allbutt and Rolleston's "System of Medicine," traces a connection between the albumin and the malarial fever, and says that albumin is more frequent in the æstivo-autumnal cases, but even here, and in the great majority of the cases, there is only a slight trace. He says also that "Nephritis is not an uncommon sequel, rare in tertian and quartan, it is by no means infrequent in æstivo-autumnal."

Manson says that during the hot and sweating stage the urine is sometimes albuminous, and speaks, under cachexia, of malaria as causing Bright's disease, but says nothing more. In the JOURNAL OF TROPICAL MEDICINE AND HYGIENE, p. 241, August 16, 1909, Dr. J. M. Swan is quoted as reporting a case of nephritis in which the quartan parasite was found accidentally, saying, "The nephritis was independent of the malarial infection." In the same number, p. 254, John M. Swan is said "to refer to the complication of chronic parenchymatous nephritis in quartan malaria." And in the same number Thayer states that albuminuria is more frequent in malignant tertian than in other malarial infections."

Dr. Malcolm Watson, in a monograph on some clinical features of quartan malaria, seems to have gone a step further than the ordinary text-book as regards renal complications, and he mentions that out of eighty-three cases of quartan fever œdema was present in twenty-seven, and that of these six had albuminuria. Further he says that "in some the brunt of the disease appears to fall on the kidneys, and parenchymatous nephritis ensues." He describes a case of quartan fever with parenchymatous nephritis, and another case with renal complications, and writes as though astonished at the albumin disappearing after the administration of quinine. But from the percentages of albuminuria in his cases of quartan fever it could be inferred only that quartan parasites might make one look for albuminuria, but not that the occurrence of the signs and symptoms which would lead one to suspect the presence of renal disease would make one think of the parasites of quartan malaria.

None of these authors give albuminuria the status in malarial diseases that it deserves. To me it does not seem that it much matters how many cases of fever get albuminuria, but, on the other hand, it is of great importance to know whether malaria is a common cause of a condition which is usually diagnosed as nephritis, and in my experience the commonest cause of this condition is the parasite of quartan malaria.

Sixty-two cases, which, in the ordinary course of events, would have been diagnosed as nephritis, came under my care in the Ipoh hospital; their symptoms were weakness, difficulty of breathing, and swelling. Of these sixty-two cases, only five complained of fever. The point I wish to lay stress on is that in these five cases only would the blood ordinarily have been examined for malarial parasites; the remaining fifty-seven cases, all of which by the record shown had albumin, would have been treated with ordinary remedies for nephritis, whereas thirty-two of the fifty-seven cases, that is, 56 per cent., had malarial parasites in their blood, and obviously the correct treatment was quinine. This conclusion I should not have arrived at unless I had examined blood-films of these thirty-two cases for malarial parasites. In other words, every medical man knows that, given the malarial parasite, he may find albuminuria, but he does not know that, given the albuminuria without any fever, he may find malarial parasites in over 50 per cent. of the cases, and that of this 50 per cent. almost 100 per cent. are quartan.

My attention was first called to this condition many years ago by the case of a Chinaman who, in addition to the symptoms of weakness, difficulty of breathing, and swelling, had a shuffling gait and an absence of reflexes; I could not get the idea of beri-beri out of my head, although the case seemed a curious one, as he had albumin. This man gave no history of fever, and had been a patient in hospital for three weeks when he unexpectedly had a rise of temperature. I examined his blood, and found the parasites of quartan malaria. Under quinine his albumin cleared up, the œdema went down, and he he left the hospital cured. After this I saw several cases, but the list attached is the result of less than one year's collection from the Ipoh Hospital. The only case (in which quartan malaria was found) that died had syphilis as well, but some of the cases left the hospital with some albumin present, and I cannot say what became of them; the greater number went out cured.

In the list attached the albumin is simply guessed from the amount of deposit after boiling.

A history of syphilis and an enlargement of the supra-condylar lymphatic glands, which is perhaps always present in syphilis, were also looked for in this series, and one or other was found in twenty of the cases. I think that sufficient attention has not been drawn to the concurrence of albuminuria with the parasites of quartan malaria or syphilis. I believe that the quartan parasite, perhaps by its coarser pig-

ment, actually irritates the kidneys. I have recently seen a case diagnosed by a medical man as nephritis in whom I found quartan parasites, and in whom the exhibition of quinine was followed by the cure of all symptoms. To me, in this country the occurrence of albumin indicates the search for quartan parasites, and if this fails, for syphilis. The presence of fever is uncommon in the cases I am writing about; albuminuria is the chief symptom.

In the attached list xx means a considerable amount, that is, a general œdema; x means that it is present.

No.	Percentage of albumin rough	Œdema	Form of parasite			Fever present	History of syphilis	Glands in arms
			M. T.	B. T.	Quartan			
1	45	xx	...	...	...	...	x	x
2	20	xx	...	.	...	...	...	x
3	10	xx						
4	20	x	...	...	x	x		
5	75	xx						
6	50	xx						
7	10	x	x	x	x	x		
8	25	x	...	...	x			
9	15	xx	...	...	x	...	...	x
10	25	x	...	...	x			
11	20	xx	...	...	x	...	...	x
12	10	x	..	...	x			
13	50	xx						
14	10	x	...	...	x			
15	50	xx	...	...	x			
16	70	xx	...	...	x			
17	10	x	...	...	...	...	...	x
18	15	x						
19	50	x	...	...	x			
20	25	x	x	...	...	...	x	x
21	30	x	...	...	...	. .	...	x
22	25	x	...	...	...	...	...	x
23	50	x	...	...	...	...	x	x
24	25	x	x					
25	10	x	..	...	x	...	...	x
26	70	x	...	...	...	...	...	x
27	75	xx	...	...	x	x	x	x
28	70	xx	...	...	..	...	...	x
29	20	x	..	...	x			
30	15	x	...	...	...	...	...	x
31	20	x	...	...	x	...	x	x
32	75	xx						
33	10	x	..	.	x			
34	10	x						
35	Slight	x						
36	20	x						
37	75	x						
38	Slight	x	...	...	...	...	x	
39	,,	xx	...	..	x			
40	75	xx	...	...	x			
41	30	x	...	...	x	x		
42	75	x	...	...	x	x		
43	25	x	...	x				
44	10	xx	...	...	x			
45	70	xx	...	.	x			
46	50	xx	..	...	...	...	x	
47	20	x						
48	90	Yes	...	...	x			
49	Slight	x						
50	10	x						
51	90	xx						
52	30	x						
53	50	x						
54	25	x	.	...	x			
55	20	x	.	...	x			
56	5	x	...	...	x			
57	50	xx	..	...	...	...	...	x
58	50	xx	.	..	x	...	x	
59	15	x	..	...	x			
60	30	x						
61	5	x	...	...	x			
62	20	x	...	...	..	...	...	x

Herpetomonas Pediculi.—In the *Annals of Tropical Medicine and Parasitology*, March 29, 1912, Fantham describes a new species of herpetomonas infesting the alimentary tract of *Pediculus vestimentorum* the common human body louse. Fantham summarises his researches on the subject as follows:—

(1) *H. pediculi* is a parasite of the body-louse, *P. vestimenti*. The parasite appears to be confined to the alimentary tract and fæces of its host (adult and larva), one phase of it having been recovered from the dejecta. The parasite is spread from louse to louse by the contaminative method, cysts of the parasite being swallowed by the insect The whole life-cycle has been followed in the living material.

(2) Movements of the flagellate are very rapid and somewhat spasmodic, and are easily accomplished by the aid of the flagellum. Rotatory motion and movements of flexion occur.

(3) The parasite exhibits three well-marked developmental phases, united by a continuous series of intermediate forms: (*a*) The pre-flagellate, which produces a flagellum and elongates, and becomes (*b*) the flagellate, which, after a growing and multiplicative phase by longitudinal fission forms (*c*) the resting, "encysted" post-flagellate form, adapted for extra-corporeal life.

(4) Pre-flagellate stages, best found in the œsophagus and proventriculus of the louse, or in the larva, strongly resemble Leishman-Donovan bodies. They are 6μ to 7μ long and 4 to 5μ broad. The nucleus and blepharoplast are well defined. A chromatophile area, from which the flagellum develops, is present.

(5) The flagellate forms occur chiefly in the mid-gut. Their body-length is from 11μ to 26μ. The cytoplasm is finely alveolar. The nucleus is round or oval, and the blepharoplast stains deeply. Aggregation rosettes of flagellates of various ages and sizes are occasionally found.

(6) Post-flagellate forms are oval. The blepharoplast seems smaller than that of the flagellate or pre-flagellate. This stage is best observed in the rectum of the louse, and can be recovered from the fæces.

(7) Experiments show that *H. pediculi* is not a stage of a vertebrate trypanosome, for Fantham fed infected lice from the time of hatching to the time of death on his own body, and made detailed examinations of his own blood by smears, thick films, and by cultures, as well as by sub-inoculations into white rats, none of which ever gave indication of trypanosomes during three years of experiments. Animals inoculated with *H. pediculi* from the gut of lice have also shown no parasites.

(8) *H. pediculi* is a parasite of the louse, *P. vestimenti*, and shows no connection with any vertebrate trypanosome. Also, it is not connected with *Leishmania*.

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THE JOURNAL OF

Tropical Medicine and Hygiene

MAY 1, 1912.

BRITISH MEDICAL ASSOCIATION.

Eightieth Annual Meeting, Liverpool.

SECTION OF TROPICAL MEDICINE, July 23, 24, 25, and 26, 1912.

President: Professor JOHN L. TODD, M.D., McGill University, Montreal.

Vice-Presidents: Fleet Surgeon P. W. BASSETT-SMITH, C.B., R.N., Royal Naval Hospital, Haslar, Gosport; WM. CARNEGIE BROWN, M.D., M.R.C.P., 32, Harley Street, London, W.; WILLIAM THOMAS PROUT, M.B., C.M.G., School of Tropical Medicine, University, Liverpool; JNO. WM. WATSON STEPHENS, B.A., M.D., School of Tropical Medicine, University, Liverpool; ALBERT JOHN CHALMERS, M.D., F.R.C.S., 79, Holland Park, W.

April, 1912.

DEAR SIR,—The Section of Tropical Medicine will meet on Wednesday, Thursday, and Friday, July 24, 25, and 26, 1912, from 10 a.m. to 1 p.m., in the Old Engineering Theatre, University, under the Presidency of Professor John L. Todd, McGill University, Montreal, when it is hoped that you will be present and take part in the work of the meeting.

The following subjects have been selected for discussion:—

Wednesday, July 24, 10 a.m.—(1) "Human Trypanosomiasis." (*a*) The question of the Specificity of the Trypanosomes affecting Human Beings. (*b*) The Methods of, and Agents concerned in, the Transmission of the Trypanosomes affecting Man. (2) "Verminous Toxins in Man and Animals."

Thursday, July 25, 10 a.m.—(1) "Leprosy." (2) "Leishmaniasis."

Friday, July 26, 10 a.m.—"Sanitation of Agricultural Estates where Large Labour Forces are Employed in the Tropics."

It will greatly conduce to the success of the meeting if members will kindly notify as soon as possible whether they propose to take part in the discussions, or wish to make any communication to the Section.

Any such communication must not occupy in reading more than fifteen minutes (about 1,500 words), and, for profitable discussion, it should be given in the following form: (i) a definite statement of what it is intended to state, suggest, or prove; (ii) a statement of the facts or arguments on which such thesis rests; (iii) a very brief summary of your leading points.

The attention of members is also drawn to the Regulations for the conduct of Sections given below, and especially to Regulation 2.

Attention is also called to Regulation 6. Papers if not read form no part of the proceedings of the Section. If, however, you are unable to be present your paper will be read for you by one of the Secretaries.

A special sub-section of the Museum is being reserved for exhibits in Tropical Medicine, and the Curator of the Museum, or the Sub-Curator of the Tropical Section, will be glad to receive photographs, pathological specimens, &c. Preparations, with full descriptive labels, illustrative of the conditions of "Leprosy" and "Leishmaniasis," would be of especial service for demonstration.

We are, dear Sir,

Your obedient servants,

H. B. G. NEWHAM, M.R.C.S., D.P.H., &c.,
London School of Tropical Medicine.

B. BLACKLOCK, M.D., D.P.H.,
Runcorn Research Laboratory, Cheshire.

Hon. Secs.

Regulations for the Conduct of Sections.

(1) Papers at the Sectional Meetings must not occupy more than *fifteen* minutes in reading, and no subsequent speech must exceed *ten* minutes.

(2) *Authors are requested to send short abstracts of their papers not later than Friday, May* 31.

(3) The text of papers submitted for publication in the *British Medical Journal* as part of the report of the Section should represent what is actually read in the Section.

(4) Each author should hand the text of his paper in proper form for publication to one of the Secretaries of the Section immediately after it is read, or, at the latest, at the end of the day's meeting

of the Section. Neglect to comply with this request may result in the omission of the paper in question from the proceedings of the Section published in the *British Medical Journal*.

(5) *Papers read are the property of the British Medical Association, and cannot be published elsewhere than in "The British Medical Journal" without special permission.*

(6) Authors of papers not read have no claim for the publication of their papers in the *British Medical Journal*. *Papers cannot be taken as read.* If not read they form no part of the proceedings of the Section.

(7) When a writer is unavoidably prevented from attending, he should communicate with one of the Secretaries with a view to having his paper read for him.

By Order of the Council,
GUY ELLISTON,
Financial Secretary and Business Manager.

The subjects for discussion have been well chosen. Trypanosomiasis, apart from its dread as a scourge, presents many features of absorbing interest. The question of specificity is to be raised; and although we cannot even hope that it will be settled, yet the discussion should prove of great value. The whole question of specificity is one which has to be approached with the utmost care and open mindedness. The question is a wide one and involves the whole question of the relations of the parasitic diseases of animals to man. Year by year these relationships are being shown to be more and more akin and the danger from a scientific point of view of attempting to specify too rigidly may in future be proved to be a retrograde in place of a forward step. On the other hand, specificity brings its comforts to pest-stricken mankind; to know that the field of possible infection is limited owing to the specific attainments of an organism narrows the zone of danger; to have to beware of an infected man only and not of the whole of infected animals at once brings the staving off of a disease within the bounds of possibility; or to know that one species of animal is alone the subject of the complaint at once removes the general suspicion with which all animals would otherwise be regarded. The extent to which domestic pets are nowadays admitted into our dwelling-houses in cities is rightly or wrongly regarded as an ever-present danger as regards certain ailments; yet the question requires much more investigation than has been devoted to it, and the specificity of the infections worked out. We want an epidemiologist to deal with questions of the kind, but a practical epidemiologist is the rarest of beings to find; there is no such appointment either officially or in connection with private societies in any country.

Of the other subjects of discussion at the Section of Tropical Diseases we observe leprosy is one. This is another subject that, for all appearances to the contrary, has never been worked out epidemiologically. No doubt many astute observers will come forward with interesting evidence as to signs and symptoms, the bacteriology, the modes of transmission, &c., &c., but the practical epidemiologist, that is, one who has gathered information by actual travel in search of evidence, will, it is, to be feared, be conspicuous by his absence.

Leishmaniasis, another subject of discussion, requires to be similarly studied, and the time has come when, if we wish to get information based on something wider than parochial lines, a department of epidemiology must be instituted to deal with disease in a comprehensive manner so as to raise the whole trend of thought and inquiry beyond mere empiricism.

Annotations.

Spirochætes and the Fusiform Bacillus.—Chamberlain contributes to the *Philippine Journal of Science* for December, 1911 (vol. vi., December, 1911, No. 6), a very interesting paper on "the occurrence in the Philippines of associated spirochætæ and fusiform bacilli in ulcers of the throat (Vincent's angina), of the mouth, and of the skin, and in lesions of the lungs (bronchial spirochætosis)."

From his series of observations Chamberlain believes that it is probable that more than one-half of the throat and mouth ulcers one is likely to encounter in the Philippines will show fusiform bacilli and spirochætæ in greater or less numbers, and that one-third of the cases will have them in preponderating numbers. This is a somewhat higher rate than has been reported in temperate climates. However, it must be remembered that in all of the cases examined by Chamberlain he was also on the look-out for these particular parasites. The associated spirochætæ and fusiform bacilli have been found in an ulcer of the skin and in two cases of pulmonary disease, but as yet there is no evidence to show that in the Philippines they are common in these situations.

Chamberlain believes that it is necessary to give a caution; that is, that the finding of fusiform bacilli and spirochætæ in a throat lesion does not justify one in resting content with a diagnosis of "Vincent's angina." Experience has shown that syphilis, diphtheria, carcinoma (and very probably other etiologic factors), must be carefully ruled out. It is also still an open question whether the associated fusiform bacilli and spirochætæ are ever causative of the multiform lesions in which they are so often found to be present.

A plate of very good microphotographs shows the two different organisms very clearly.

The So-called Parasite of Yellow Fever.—In the *Medical Record* of March 30, 1912, Agramonte severely criticises Seidelin's so-called parasite of yellow fever, and also certain remarks made by the latter in a recent paper published in the *Yellow Fever Bulletin*.

There is no doubt that Seidelin laid himself open to such criticism, and certainly most people competent to judge, who have seen his parasites, are by no means certain that they have anything to do with the cause of yellow fellow.

Agramonte brings forward the following reasons why Seidelin's bodies are not at all convincing to him; in fact he (Agramonte) is doubtful that the bodies are parasites at all:—

(1) The preparations, stained by the Giemsa stain, had been very poorly treated. So much so, that the leucocytes had not taken their due colouring, many eosinophilic cells remaining unstained while others were intensely so, showing evidently a faulty technique and therefore unreliable results.

(2) Dr. Seidelin's supposed parasite is present in very limited numbers in each blood drop, not more than three or four, all unlike, in each preparation, and we know that infective blood, in yellow fever, must contain a great number of parasites if the amount necessary for infection is to be a criterion.

(3) Experiments have demonstrated that yellow fever blood is not infective after the third or fourth day, while Dr. Seidelin's bodies have not been observed by him except from the fourth to the eighth.

(4) There is no reason to believe that the parasite of any infectious disease may be demonstrated in the blood at any period when this blood is not infective.

(5) If the bodies shown by Dr. Seidelin were evolution forms of an animal parasite, as he claims, we would find several of them at least in the same period of their evolution in the same smear, and they would therefore present the same morphological characters: while as it is, it is not possible to find two bodies alike in the same preparation, except in the liver section, in which they are all four inside a cell.

(6) There is no analogy, as Dr. Seidelin admits, between the supposed parasites and other organisms found in the blood of man or animals.

(7) Finally, it is imposible to form an opinion that will carry weight founded upon smears stained in such imperfect manner, and with such an unstable reagent as the Giemsa stain, and less so when the various characters of form and size presented by the Seidelin bodies are such that they ought to be readily observed in fresh preparations of blood, in which it would be easier to differentiate them from platelets and protoplasmic and nuclear cell fragments.

Rapid Diagnosis of Malaria.—In the *British Medical Journal*, April 20, 1912, Cropper describes a rapid method of diagnosing malaria. The method is as follows: Thick films are made on a slide without even a cover-slip, so thick that the blood when allowed to run to one side is seen of a bright red colour. This is rapidly dried and examined directly under a drop of cedar oil and a $\frac{1}{12}$ in. immersion. The drying of this film causes the only delay. In a dry country such as Persia films will dry in the open air without any special treatment in about half a minute. In a damper climate they should be exposed to the sun turned upside down. In damp and cold weather they should be dried gently over a spirit flame. In any case one can begin the examination before the *whole* film is dry, and very often the information got is sufficient before the thicker edge is properly "set." One may often prove the existence of malaria, verified, of course, by a properly stained slide, in one minute by the watch from the time of drawing blood. The thicker part of the film is best examined first, and from the character of the pigment the species of malarial parasite can, after a very little practice, be diagnosed in most cases with great ease, almost as easily as in a wet film. The diffuse and fine dots of tertian, the compact and coarser dots of quartan, and the peculiar arrangement of the pigment in the crescents in malignant malaria are very characteristic, not to mention pigmented leucocytes. They are as well seen as in a wet film, the chief point being to be sure that the pigment is on the same level as the red corpuscles, and disappears totally on focussing up or down. If no characteristic pigment is found in two minutes the case is most likely not one of malaria; in any case of doubt, of course, the other methods are available, but probably not more than one case in ten of untreated malaria would escape detection. Dr. Cropper does not pretend for a moment that this is a method by which beginners can study malaria, any more than by that of Sir Ronald Ross; but it is very rapid and accurate, and one, moreover, which avoids nearly all the pitfalls inseparable from those more commonly used, and, indeed, from Sir Ronald Ross's method, which Dr. Cropper himself has tried. At starting, of course, a student should compare his dry slides with slides carefully stained in the usual way. This gives confidence, and is a valuable check to the work. Dr. Cropper has no hesitation in saying that once his method is given a fair trial it will be found of real use in out-patient work in tropical countries, where stress of work makes every minute of the greatest value.

Dysentery in Fiji.—Bahr, in a report to the London School of Tropical Medicine, on investigations on "Dysentery in Fiji during the year 1910," gives some interesting particulars as regards the occurrence of the different types of that disease in those parts. Bacterial dysentery would seem to be the commonest form and gives rise annually to well-marked epidemics. In this epidemic dysentery bacilli morphologically and culturally identical with Shiga's and Flexner's bacilli have been isolated. No special strains were found to be connected with special clinical types of the disease, however. The epidemic, which is of annual occurrence in Suva, takes place during the period of greatest heat and greatest aggregate rainfall, and there is strong presumptive evidence to show that house-flies are the principal agents in the spread of the disease. Clinically cases of all degrees of severity were encountered from mild or catarrhal varieties to acute or ulcerative and toxic or fulminant.

Pathologically, the large intestine was affected throughout its whole extent in every case. The

small intestine appeared normal in all but two cases. Necrosis and gangrene of the mucous membrane were the most constant features, but in cases of long duration sloughing of the necrosed mucous membrane over considerable areas had taken place. The rectum was in many instances severely affected.

As regards amœbic dysentery, amœbæ were found in the stools in a limited number of instances—the incidence of these cases bore no relation to the season of the year. The clinical history and course of all these cases were quite distinct from those of the epidemic variety, as were also the pathological findings.

The amœbæ found in the dysenteric discharges approximated the type of Schaudinn's *Entamœba histolytica*.

Linguatula Serrata in a Central American native.—Darling and Clark, of Ancon, C.Z., report a case of linguatulid infection in a native Central American. (*Archives of Internal Medicine*, vol. ix, April, 1912, No. 4.)

They state that two cases of infection by linguatulids have been observed at Ancon Hospital during the past six years, and while the condition is not uncommonly met with at autopsy in Europe, and infections by other representatives of the *Linguatulidæ*—*Porocephalus armillatus* and *moniliformis*—have been reported from Africa and Asia, the literature appears to afford no example of an infection by *Linguatula* in a native of America.

A case reported by Aitken was one in which *P. armillatus* was found in the lungs and liver of an African negro soldier, who died about eight months after leaving Africa. "Although in this instance the negro was stationed in Jamaica, it is most probable that he had the germs of these parasites within him when he left his native shores in some part of Africa, and that this parasite is endemic neither in St. Helena nor in Jamaica."

In Darling and Clark's case a larval linguatulid was found at the autopsy of a Nicaraguan crawling over the cut surface of the lung and along the pleura. As this was the only larva found its exact location during the life of the patient could not be determined.

It may have been free in the pleural cavity, encysted in the lungs, or free in a bronchus. A very careful search was made, however, by the authors, through the accessory nasal sinuses, pharynx, lungs, bronchi, and other cavities and viscera, but no adults or other larvæ were found.

A study of the parasite proved it to be the larval form of the *Linguatula serrata*. The authors state that this parasite is most usually found in dogs and wolves, but it has also been reported in man. As regards man, for example, they say that: "Virchow found the parasite in Würzburg and Berlin; Wagner in Leipzig; Frerichs in Breslau, five times in forty-seven autopsies. Zenker first called attention to the occurrence of the larva in man, having found it nine times in the liver in 168 autopsies. According to Zaeslin, two cases occurred in Basel in 1,914 autopsies. At Kronstadt larvæ were found six times in 659 autopsies, most frequently one or two specimens being found in the liver."

"In dogs, Friedberger and Frohner state that the parasite is found more commonly in some districts than in others. They found it frequently in Berlin, but only exceptionally in Munich. Hering found it once only in Stuttgart, while Colin found it in sixty-four out of 630 Parisian dogs examined. The parasite seems to be present only in the larger breed of dogs, such as the mastiff and butchers' dogs, and was found oftenest in the ethmoidal cells firmly attached to the mucosa."

Abstracts.

YELLOW FEVER PROPHYLAXIS.[1]

By Harald Seidelin.

As a consequence of the knowledge of yellow fever as an insect-borne disease, hard and fast rules were laid down for its prophylaxis, and it appeared that this question had been settled for all time. Many good results obtained have justified the application of these rules, but the failure, in some cases, of exterminating yellow fever by similar measures, makes it necessary to open the discussion anew. This failure cannot have been due, so much seems evident, to any error in the fundamental rules; the reason will have to be sought, either in a deficiency in their application, or there may possibly exist errors in details of the theory as it stands. If the latter possibility be admitted, the details in question must be such as have been of no importance in the cases in which satisfactory results have been obtained, whilst in some instances they have been of sufficient importance to make the measures taken more or less useless.

Immediately after the doctrine of mosquito transmission had been recognized as the correct one by the United States Health Authorities in Cuba, the campaign against yellow fever was organized on this new basis, in Habana, 1901, and soon resulted in the extermination of the disease. Subsequently similar campaigns were started in Panama, Colon, Rio de Janeiro, and other cities, likewise with good results, which in the case of Rio were particularly striking, since sanitary reforms, which had shortly before been carried out according to ordinary rules of hygiene, had remained entirely without influence on the yellow fever situation. The measures which were taken in these campaigns, and which have since then continued to form the basis for the whole prophylaxis against yellow fever, can be divided into the following three groups:—

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[1] *Yellow Fever Bureau Bulletin*, vol. i, No. 10, February, 1912.

(1) Mosquito destruction.
(2) Protection of yellow fever patients against mosquito bites.
(3) Protection of non-immune individuals against mosquito bites.

The last-mentioned measure has probably never been carried out satisfactorily except in individual cases, and must, as a matter of fact, always remain of very limited utility when we have to do with a house mosquito like *Stegomyia fasciata*, which in infested towns is met with almost everywhere, and in large numbers. Mosquito-proof houses are of a relative value, even if it be true that infected mosquitoes bite at night-time only. They seem never to have played a great rôle in the anti-yellow fever campaigns, and the only proof on a large scale of the importance of the protection of non-immunes still remains in the oft-quoted example that well-to-do foreigners, having their work in Rio, but remaining during the night in the Stegomyia-free Petropolis, escaped yellow fever, even when severe outbreaks prevailed. This single instance is not in strict accordance with the experimental observations on the biology of *S. fasciata*, since the foreigners in Rio are said to leave for Petropolis several hours later in the afternoon than infected females, according to Marchoux and Simond, begin to bite.

For people living in a city, life will always be extremely difficult and full of inconveniences if they have to protect themselves absolutely against mosquito bites, should it be from dark to morning only. This measure will never be practicable as anything like a thorough protection where a large number of non-immune foreigners belonging to different social classes are present amongst a native population, from which they do not keep entirely apart socially. It will, therefore, only be possible in colonies where a few well educated and well disciplined Europeans are living isolated in an infected country.

A partial isolation is obtained by means of the so-called segregation, *i.e.*, the Europeans live in a separate quarter of a town, as far as possible from the dwelling-houses of the natives. In this case the object is to obviate, not the bites of mosquitoes in general, but the bites of infected mosquitoes. The latter system has been extensively adopted in British Colonies, in Africa and elsewhere.

In the large majority of cases one has to consider the first and second of the measures mentioned. Isolation of yellow fever patients in mosquito-proof rooms naturally suggests itself as the simplest and most rational way of solving the problem. It would certainly be so, could it be carried out in anything like a thorough manner, but it meets with many difficulties, at any rate in endemically infected areas. To be even approximately effective, isolation must take place from the very beginning of the disease. Cases must be isolated before a diagnosis can be made on the mere suspicion of yellow fever—that is to say, in the case of any elevation of temperature the cause of which is not quite clear. This is carried out in some places, and in a more or less systematic way, when foreigners are concerned, but certainly in no endemic area are all natives with vague febrile symptoms isolated. Recent experiences, however, go far towards demonstrating the truth of the view already expressed by many writers on the subject, that the natives form the most important source of infection. Typical cases have been observed in natives, and some of these cases have occurred under conditions which make it probable that the individuals attacked had not been exposed for many years past to the infection. This forms the best proof that no race immunity exists, but that the immune natives have acquired their immunity through one or several attacks of the disease. Natives with typical yellow fever constitute a particular danger, because the diagnosis is generally not made until very late in the disease, if at all, as many physicians are opposed to accepting the diagnosis of yellow fever in natives. A still greater danger, however, exists, from an epidemiological point of view, in the atypical cases in native children and adults.

The yellow fever parasite when introduced into a previously immunized organism may not develop at all, but it appears likely that it may sometimes, or often, develop to a certain extent before being destroyed; in such a case their presence might never make itself known through clinical symptoms, though being sufficient to produce infection in other mosquitoes. This is the theory which most probably explains the continuous preserving of the virus in endemically infected areas. If accepted, it must at once be admitted that the isolation of patients with typical yellow fever symptoms cannot be expected to lead to the extermination of the disease in an endemic focus. It may, perhaps, keep from the possibility of propagation some of the most virulent of the parasites, though at present we know almost nothing as to their differences of virulence.

Then comes the question of the duration of isolation. According to the generally accepted doctrine, the blood is infectious during the first three or four days only in cases of yellow fever. Cases are, as a rule, however, kept isolated until convalescence is established. Isolation, whether of patients, or of non-immunes, can never be satisfactorily carried out. The corresponding measures should always be taken where Stegomyia are present, but they afford, as a whole, rather unreliable protection.

The only radical measure is mosquito destruction. This measure should be carried out in times of peace, when no yellow fever is present, in all exposed areas, and with more reason still where an outbreak already exists, or in countries recognized as endemic foci. The objection is often raised against mosquito destruction that it is impossible. The impossibility has already been disproved in many places, and the logical outcome of many successful anti-mosquito campaigns would seem to be that the complete extermination of mosquitoes is always possible, at any rate in cities. It is quite certain that the problem is often an extremely difficult one; the measures to be taken are generally costly and must

be continued with a persevering and never-failing energy.

In endemic foci Stegomyia are probably always abundant. Exact data from all places are not available, but more or less exact statistics have been prepared in some places, and from many others the the general impression is reported that *S. fasciata* is the prevailing or, at any rate, a very common mosquito. It may, of course, not be out of the way to fumigate all houses in which yellow fever cases have occurred, but too much importance should not be given to this measure. All available energy should be directed towards the prevention of mosquitoes obtaining breeding places.

This is done by abolishing all collections of water which are not absolutely necessary. Water containers which are retained as indispensable must be looked after in some way or other so that they cannot serve as breeding places. If practicable, and especially in the case of drinking water, they should be protected by means of a well-fitting cover or wire gauze. It would certainly be much better to provide a central, pipe-borne water supply for drinking and other purposes, and thus make the larger number of water containers superfluous, but this is not always practicable, either on account of the prohibitive cost, or because no proper drinking water is to be found besides rain water.

In water which is retained for ornamental purposes fish stocking should be made obligatory; the presence of a few gold fish or other fish, of which already a large number are known as larvæ-eating, will effectually exclude all danger.

In the case of cesspits or other water collections which cannot at once be dispensed with, oiling becomes necessary. For this purpose mixtures of crude and refined petroleum in varying proportions are most extensively used. The quantity of oil necessary is, according to Boyce, one ounce to the square yard (30 c.cm. to the square metre). A larger amount must be calculated if the water is exposed to the wind than in the case of an absolutely quiet surface, as in the former case the continuous layer will easily be disturbed. The oil will disappear through evaporation after a period, the length of which depends on the exposure to the sun, the prevailing temperatures, and the presence or absence of air currents. It should, therefore, be renewed with sufficient frequency to assure that it will never be absent during a time long enough for the development of the mosquito from egg to imago. For this period a minimum of about twelve days may be calculated in order to be efficient.

In addition to its suffocating effect on the larvæ, oil will also prevent female mosquitoes from depositing their eggs in the water, but this action is of less importance, as the layer is not constantly present.

Mosquito larvæ do not thrive in water which is in constant movement. Oiling is therefore superfluous, as it would be useless in the case of running water, but, on the other hand, it should not be taken for granted too readily that a certain water container may be left unprotected because the water is frequently moved. Thus, in Mérida, all wells which are provided with a pump must be kept properly covered, whilst no precautions are obligatory if the water is extracted by means of a bucket. Larvæ, however, have repeatedly been found in wells belonging to the latter class, and the matter is at present being reconsidered by the health authorities. It would appear that each particular case will have to be considered separately, on its own merits.

That a certain water container is said to be emptied daily does not obviate the necessity of precautions, as it often happens that a few drops of water are left in the bottom of the container each time it is emptied, which will be sufficient for the larvæ to live in until it is filled again.

All these precautions could be carried out easily and with comparatively small expense in each case, if all house-owners would look after the sanitary conditions of their premises. This might be made obligatory, just in the same way that it is incumbent on the owner of a house to maintain a proper sewerage system; but in order to produce satisfactory results, health ordinances to that effect would make a careful inspection necessary to make sure that the regulations were complied with. The inspection would have to be frequent, with intervals not longer than ten days, thus making it impossible for eggs to develop into imagines in the maximum of time during which an infringement of the rules might persist. Better results, however, will often be obtained if the health authorities directly take charge of the situation and carry out the oiling process and all other precautions. A special tax for this purpose would probably encounter but few objections, when house-owners at the same time would find themselves exempt from all responsibility, and nevertheless get rid of the mosquito nuisance.

In exposed places the only rational measure of protection, which ought to be taken always, is Stegomyia destruction, or rather, complete Stegomyia extermination. When this has been accomplised, all danger of large epidemic outbreaks will have disappeared; there is only the possibility that some imported infected mosquitoes might give rise to a few cases, but the infection would not spread supposing the anti-mosquito measures were carried on continuously. Even the occurrence of a few isolated cases ought to be avoided, and it is therefore necessary to take good care that no infected Stegomyia are imported. To be quite sure, no mosquitoes, Stegomyia or others, infected or non-infected, should be allowed to be introduced. This is the only precaution necessary, as there is no danger whatever in a Stegomyia-free place, even if cases of yellow fever gain access without being diagnosed.

If, on the other hand, Stegomyia are present, strict quarantine measures both against yellow fever cases and against mosquitoes cannot be dispensed with.

Anti-mosquito quarantine consists in careful fumigation of all ships arriving from ports infected with, or suspected of being infected with yellow fever. Under existing international sanitary conventions it may not be feasible to extend this measure to apply

to ships arriving from ports from which no cases of yellow fever have been reported for a considerable length of time, even though Stegomyia are known to be abundant.

If a ship is unprotected, all its parts should be fumigated unless it carries a certificate that it has remained moored during the whole duration of its stay at an infected port, at a safe distance from the shore, *i.e.*, at a distance of about 200 metres in the case of an open port, whilst in closed ports and rivers this distance would probably not be sufficient. The certificate should guarantee also that mosquito-free lighters were used in loading and unloading.

In the case of ships provided with a certificate of this kind, or in that of screened ships, no fumigation ought to be obligatory, but might be made dependent on the result of a careful inspection. Holds which have been opened whilst the ship was in dock or near the shore should be fumigated in any case, and the fumigation must necessarily take place before unloading.

During epidemics the chief measures in the campaign are isolation of patients and destruction of adult infected mosquitoes.

Patients should be isolated on the mere suspicion of yellow fever, and continue isolated until another diagnosis has been definitely established or, if confirmed, until the termination of the disease.

The measures for destruction of adult mosquitoes consist in fumigation of infected and adjoining houses and, when means are available, of the whole block of houses, and as many houses in infected quarters as possible.

For fumigation purposes, sulphur still occupies the first place. It has the advantages of being reliable, comparatively cheap, and easy to use everywhere, as it does not require the use of any special apparatus. Its chief and perhaps only essential inconvenience consists in the damage which it causes to many articles, especially when metals, fruits, vegetables or living plants are concerned. The danger of fire may be disregarded when proper precautions are taken. But though it be the only inconvenience, the damaging effect of sulphur dioxide forms a very grave objection to its use in many cases. It is, therefore, highly desirable to substitute for it some other substance, but so far none has been accepted as quite satisfactory.

Pyrethrum powder, which is burned in the proportion of 3 lb. to 1,000 cubic feet, or 37 grams per cubic metre, is frequently used instead of sulphur, when perishable goods are concerned. It does not kill the mosquitoes, but stupefies them only; it is, therefore, necessary to collect all mosquitoes immediately after fumigation and burn them. This is a great drawback to the method, as some insects will always be likely to escape detection, in spite of all precautions taken, by means of paper coverings over irregular surfaces, &c. Another drawback is the comparatively high price.

TRICHOSPOROSIS NODOSA.[1]

By J. M. H. Macleod, M.D.

THE specimens of hair which form the subject of this communication were obtained through the kindness of Dr. E. Minett, of the Government Bacteriological Department, George Town, Demerara, British Guiana, and were hairs from an aboriginal Indian girl, of the tribe Atavy, living in the Rupununi District. The hairs were black in colour, rather fine, and presented on the shaft a number of hard nodules varying in size from minute specks like particles of grit up to small pins' heads. In some cases the nodules were so small as to be scarcely visible to the naked eye, but, however small, they could invariably be felt by pulling the hair through the free borders of the nails of the thumb and one of the fingers. The nodules were roughly oval in shape, brownish-black in colour, hard, firmly attached, and either situated on the side of the hair-shaft, or formed a concretion completely ensheathing it.

They varied in number from two to three to a dozen or more, and were distributed irregularly on the shaft, sometimes close to each other, and at other times at considerable intervals. They were most numerous at some distance from the scalp, and were stated to be absent on the intra-follicular portion of the hair.

Microscopical Appearances.

When softened in liquor potassæ, and examined under a low power of the microscope, the nodules were found to consist of a mass of spores forming a concretion which was at first entirely outside the cuticle of the hair. Later, as the concretion increased in size, it appeared to exert a destructive action on the cuticle, and even on the cortex, separating the cells, causing the surface of the hair to become frayed, and rendering it liable to fracture opposite them. With a higher power the mass was observed to be made up almost entirely of spores, no definite mycelial filaments being detected. These spores were usually large, and were recognized as being most probably those of the fungus to which Behrend gave the name of *Trichosporon giganteum*. These had a strikingly regular arrangement. At the periphery of the nodule they were oblong in shape, about 12 μ in length and 5 μ in breadth, and were arranged at right angles to the hair-shaft so as to form a pallisade layer, while next the hair they were irregular and polygonal in outline, and tended to be arranged like the cells of a honeycomb or a mosaic. In some instances there was a peculiar fan-like grouping with rows of spores radiating from a central base. The spores had a yellowish appearance, owing to the presence of diffuse colouring matter and pigment granules in the protoplasm, and were held together in a mass by a viscid cement substance which formed a sort of capsule enclosing them.

[1] From the *British Journal of Dermatology*, April, 1912.

Cultivation.

Cultivation experiments were done with the assistance of Dr. Macleod's colleague, Mr. Topley, Bacteriologist, Charing Cross Hospital, and a characteristic culture was eventually obtained by soaking small pieces of the hair containing nodules for five minutes in absolute alcohol, and planting them on proof agar. Nodules were also grown on broth, and gave a white flocculent culture, which when planted on proof agar gave the same growth as that obtained directly. The agar tubes were inoculated in a cool incubator at about 16° C. About a week after the inoculation a small white, solid speck, about the size of a large pin's head, appeared on the surface of the medium; this increased in the course of a week to the size of a split-pea, and assumed a greyish-green tint which spread from the centre to the periphery, and had a slightly powdery surface, but no marked duvet. In the course of another week the culture had reached the size of a sixpence, forming a heaped-up roundish mass with a crenated nodular border, and the greyish tinge had become replaced by a brownish colour which gradually darkened to that of milk chocolate.

Microscopical preparations from the culture in broth showed irregular branching mycelial filaments with spores at varying intervals and "endogonidia" containing small spores of different sizes and granules.

The cultural appearances corresponded with those obtained by Minett in British Guiana, who found that the fungus gave a cloudy growth on broth, which under the microscope looked like branches of oblong spores with very few branching filaments, the spores being "ovoid in shape, with a long tail resembling a drumstick, and many of the filaments having spores at each end." On glucose agar a white growth was obtained from each of the nodules which gradually changed in colour to brown.

General Remarks.

There seems to be little doubt that the condition above referred to is identical with that which was described and frequently occurs in the Valley of Cauca, in Colombia, where it is known on account of the stony hardness of the concretions as "Piedra." It has been observed also in other parts of South America. According to Minett, it is rare in British Guiana, and occurs only among the aboriginal Indians upon the Brazilian border, being confined to women, and so far he has never met with it amongst the white, black or coolie women in the colony. It has been observed also in India and Ceylon (Castellani).

A closely allied condition has been known for many years in Europe, both on the Continent and in this country, where it has been described under a variety of names, such as *Tinea nodosa* (Morris and Cheadle), *Piedra nostras* (Unna, Behrend and Trachsler), *Trichomycosis nodularis* (Duhel-Renoy), and in all probability it was the "chignon fungus" (Beigel and Tilbury Fox). In the tropics it generally affects the scalp-hairs of native women, but it has been found also on the eyelashes and the hair, moustache and beard in men; in most of the cases met with in temperate zones it has affected the beard or moustache.

The origin and means by which the fungus is implanted on the hairs are uncertain. It is known to be contagious, and it has been suggested that it may be spread by the mucilaginous fluid resembling linseed oil with which the native women dress the hair.

In British Guiana the natives attribute it to bathing in certain white or milky waters, and state that if they bathe in the brown peat bush-waters it does not occur.

Diagnosis.

Trichosporosis nodosa has to be distinguished from the more common affection, known as leptothrix, which was described in England as early as 1869 by Paxton, and subsequently named by Erasmus Wilson. Considerable confusion has arisen between these two conditions, which are quite distinct, on account of certain names which have been applied to leptothrix, such as *Trichomycosis nodosa* (Paterson), *T. palmellina* and *T. tropica* (Castellani). In leptothrix the hairs of the axilla and occasionally the scrotum are involved, and the condition is much more common than *Trichosporosis nodosa*. It is frequently associated in the axillæ with red sweat, the moisture in those parts appearing to be an important factor in its development. In leptothrix the hairs, instead of having a nodose appearance, are thick, irregular, and ragged, owing to the presence of concretions on the surface which are broken up into lobes arranged roughly like the barbs of a feather, or form irregular masses of a reddish-brown tinge. The hair itself is eventually affected by the concretion, which causes a splitting up of the fibres and a tendency to fracture in a bush-like manner. These concretions, instead of being made up of spores, appear to be chiefly composed of a cement substance, which becomes hard and chitinous, and is somewhat allied to that which fixes nits to the hair shaft. This cement is believed to be secreted by a micro-organism, and various microbes have been described in connection with it.

Treatment.

The treatment of *Trichosporosis nodosa* is unsatisfactory chiefly on account of the practical difficulty of removing the concretions from the hair, and the condition never shows any tendency to spontaneous recovery. The treatment indicated is somewhat similar to that employed for the removal of nits from the hair, and consists in the application of some solvent such as benzine, turpentine, paraffin or petrol followed by a thorough washing with soap and water. This procedure, however, seldom effects a cure, and it is generally necessary to resort to the more drastic measure of shaving the scalp or cutting the hair short. When this is done the disease is said to recur when the hair grows, unless some antiseptic precautions are taken with the object of preventing any of the spores which may be left about the scalp growing on to the hairs again. Consequently, after the hairs have been cut short it is necessary to apply daily some antiseptic remedy to the scalp such as 1 in 8 carbol-glycerine, 1 in 2,000 perchloride of mercury solution, or a 3 per cent. ointment of ammoniated mercury.

THE OUTBREAK OF YELLOW FEVER IN YUCATÁN.[1]

THE outbreak of yellow fever in Yucatán still continues, although lately but few typical cases have occurred. Dr. Lebredo's report has already been published in the *Bulletin*, and the opinions expressed by Drs. Licéaga and García have also been mentioned in earlier numbers. At the present time parasitological and other investigations are being carried out on the spot by the Scientific Secretary of the Yellow Fever Bureau.

Various observers who have studied the conditions prevailing in Yucatán have held different opinions as to the origin of the outbreak. Licéaga has pointed out that it would seem strange that no typical cases should occur, for a considerable length of time, in the large foreign population always present in Mérida, if the infection were continually existent in the form of mild cases in natives. He, therefore, has suggested that there may be, besides the blood of infected individuals, another source of infection, as yet unknown.

A similar position has been taken by Dr. Casares, chief of the sanitary delegation of the Mexican Federal Government, in Yucatán, who maintains that the mosquito theory, as generally accepted, does not explain the existence of long intervals between spontaneous, *i.e.*, non-imported outbreaks of yellow fever. He mentions the possibility of the infection existing in animals, but admits that the existence of atypical cases in native children might constitute a sufficient explanation.

A different position is taken by Lebredo, who evidently is satisfied that the infection is, and has been for a long time, endemic in Yucatán and, more especially in Mérida, in which case the occurrence of typical cases is explained without difficulty.

Garcia, on the other hand, is of opinion that the infection probably has been imported from other parts of the peninsula, particularly from Quintana Roo.

It is to be hoped that parasitological investigations, combined with clinical observation, may throw some light on these vexed questions and, perhaps, finally solve them. Already at this early stage of the investigations so much can be said that both clinical observations and the examination of the blood would seem to show that a considerable number of slight feverish attacks, lasting from one to a few days, with no definite symptoms, are really infections of the same nature as the well-pronounced cases of yellow fever. If this be true, it would also be evident that no campaign against yellow fever can be efficient if it does not have for its result the complete or nearly complete extermination of Stegomyia, and that the danger of a certain place, as regards yellow fever, does not depend on the existence of one or a few cases of well-characterized yellow fever, but on the prevalence of Stegomyia, provided that the place has been endemically infected for years past.

These conclusions are not new; they are simply the logical deductions from clinical and epidemiological observations made already by earlier authors and, in recent times, by Marchoux and Simond, by Guiteras, and by many other investigators. The conclusions have, however, always been met with objections, especially when they have been used as a basis for measures to be carried out in practice. The position evidently would be, not only safer, but also much easier, for the sanitary authorities, if the demonstration of a parasite could put the diagnosis on a firm footing, and thus serve as the basis for the measures to be taken. This means, and this means only, has made it possible to successfully combat several other infectious diseases.

During this particular outbreak the climatic conditions seem to have favoured, to a high degree, the multiplication of mosquitoes. The summer of 1911 was exceptionally hot and rainy, and the heat continued for a long time; even during the last week of December great heat prevailed in Yucatán. In January the weather was very irregular, sometimes rather cool, but with hot days intervening; it had also, moreover, been very rainy, though this month usually belongs to the dry season. The result of these conditions is that mosquitoes abound in all parts of the city—in fact to such a degree that it would be difficult to find a house where no larvæ could be discovered, and probably impossible to find one in which mosquitoes were absent.

A point of considerable interest is that several cases lately observed have been due to infection outside of Mérida, though not so far away as Quintana Roo, which was considered by García as the source of the infection. The principal focus is probably still Mérida, but the infection seems to be widespread in villages also.

The campaign against yellow fever is, as it will be readily understood, considering the conditions described, one of extreme difficulty, but both the Governor, himself a physician, and the health authorities, are very much alive to the importance of the problem and will spare no efforts to solve it Anti-mosquito work is being carried out on the accepted lines, but is seriously hampered by economic difficulties. The number of sanitary inspectors and of petrolizing squads is insufficient. Reforms, have, however, been proposed by Dr. Casares, which will, if carried through, make it possible to undertake the work on a larger scale. Thus, it may be hoped that it will become possible finally to exterminate mosquitoes, and make yellow fever disappear from Yucatán.

[1] From the *Yellow Fever Bureau Bulletin*, No. 10, February, 1912, University of Liverpool.

LONDON SCHOOL OF TROPICAL MEDICINE.

EXAMINATION RESULT (THIRTY-EIGHTH SESSION, APRIL, 1912).

S. N. Roy, F.R.C.S.Edin., M.B.Calcutta (with distinction).
Major H. R. Brown, I.M.S., L.R.C.P., L.R.C.S.Edin., L.F.P.S.Glas. (with distinction).
W. B. Johnson, F.R.C.S., M.B., B.S. (Colonial Service), (with distinction).
Capt. J. C. Oxley, I.M.S., F.R.C.S.Edin. (with distinction).
A. K. Contractor, M.B., B.S. (with distinction).

C. W. McKenny, M.D., B.Ch., B.A.O.Dubl. (Colonial Service)
C. Monge, M.D. (Peru).
Miss B. Hamilton, M.B.Dubl.
R. V. Clayton, M.B., B.S.Durh.
W. G. Cobb, M.B., Ch.B.Edin. (Colonial Service).
G. E. Aubrey, M.D , B.S.Lond.
Capt. P. M. Rennie, I.M.S., M.B., Ch.B.Aberd.
D. F. O'Donoghue, L.R.C.S.I. (Colonial Service).
W. R. Parkinson, F.R.C.S.Eng., L.R.C.P. (Colonial Service).
J. E. Hailstone, M.R.C.S., L.R.C.P. (Colonial Service).
J. Stewart, M.B.Irel.
J. P. B. Snell, L.M.S.S.A. (Colonial Service).
G. C. Purvis, M.D., B.Sc.Edin.
P. C. Conran, M.R.C.S., L.R.C.P. (Colonial Service).
S. Azmy, M.R.C.S., L.R.C.P., Dip. in M. & S. (Egypt).
Major D. C. Kemp, I.M.S., M.R.C.S., L.R.C.P.
A. Mouat, M.B.Edin. (Colonial Service).
K. Manson, M.B., B.S.Durh. (Colonial Service).
W. A. Murray, M.B., C.M.Aberd.
R. H. Nolan, M.B., Ch.B.Edin. (Colonial Service).
V. G. L. van Someren, L.R.C.P. & S.Edin. (Colonial Service).
P. W. Black, L.R.C.S.I. (Colonial Service).
L. Doudney, M.R.C.S., L.R.C.P. (Colonial Service).
T. R. Sandeman, M.B., Ch.B.Edin. (Colonial Service).
F. C. V. Thompson, L.M.S.S.A. (Colonial Service).
W. M. Nairn, M.B., Ch.B.St. Andrews.
C. G. Grey, L.M.S.S.A. (Colonial Service).

THE ROYAL COMMISSION ON VIVISECTION.

MR. STEPHEN PAGET, the Secretary of the Research Defence Association, has written a book summarizing in ten chapters the evidence given before the Commission, as well as the Inspector's Report for 1910. The volume also contains in a final chapter a brief account of the Commission's Report, as well as an important introduction by Lord Cromer, which contains a justification of his acceptance of the Presidency of the Society, a critical survey of the Report, and an earnest appeal for calm study of the facts disclosed. The book is intended to serve as an aid to this object. The book will be published by Mr. H. K. Lewis, and we reserve further comment until the volume is before us.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"Medical Record," vol. xxxi, No. 12. March 23, 1912.

Pellagra in the Canal Zone.—Deeks reports a series of cases (12) of pellagra amongst coloured people working in the Canal Zone. The cases seem to have been quite typical. The author presents a line of treatment which he thinks may prove useful. He does not discuss the different theories at present advocated as to the etiology of the disease.

The "Journal of the American Medical Association," vol. lviii, No. 9, March 2, 1912.

Salvarsan and Syphilis.—Nichols reviews the treatment of syphilis by salvarsan in a very interesting paper in the above number of the *Journal of the American Medical Association*, entitled "The Present Status of Salvarsan Therapy in Syphilis." In his conclusions Nichols states that the use of the combination of mercury and salvarsan has been taken by some old-line syphilographers as an admission of the failure of the latter, and various disparaging remarks have been made about the inexperience and rashness of various workers who "rushed" into the field of syphilis with salvarsan. It is perfectly true, Nichols goes on to say, that the spirochætes are more difficult to eradicate than many of the younger workers imagined; but, for all that, salvarsan has come to be an integral part of the modern conception of the treatment of syphilis, and we can never go back to the old ways of handling the disease. No one properly equipped to treat syphilis, and in his right senses, would think, in these days, of waiting for secondaries before beginning treatment. In the same way, no one who is properly equipped will fail to use salvarsan when it is indicated. In 1903 Metchnikoff transmitted syphilis to apes and thus started a movement which eventually robbed the disease of its mystery and gave it its place among the infectious diseases and threw it open to work along modern lines. In rapid succession came the discovery of the cause in 1905, a means of serum diagnosis in 1906, and a method of specific treatment in 1910. All these contributions came from the laboratory, and they form inter-dependent parts in the modern conception of the disease, which is radically different from many of the older conceptions. There is no occasion, Nichols believes, for quarrel with the older methods unless the issue is forced, and while salvarsan has not fulfilled all expectations, the day of modern achievements is young and the future of syphilis belongs to those who follow the disease along the lines laid down by Metchnikoff, Schaudinn, Wassermann, Noguchi and Ehrlich.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

NOTES ON A CASE OF SLEEPING SICKNESS TREATED IN LIVINGSTONE HOSPITAL DURING 1911.

By G. W. Ellacombe, M.R.C.S., L.R.C.P.

Acting Principal Medical Officer Northern Rhodesia.

History of Case.

A. S., European, aged 31, has been prospecting in different parts of Congo for the last ten years.

His previous history excludes the possibility of his having contracted the disease in the endemic areas in Northern Rhodesia, namely Luapula and Lake Tanganyika. As regards the Luangwa Valley, in 1905 he visited Hargreaves and Chutika, and from there went to Feira on the Zambesi, and has never since been to North-eastern Rhodesia or Nyasaland.

Whilst prospecting in the Congo during January, 1910, he stayed for one week at a village called Kakora on the banks of the Lualaba river, in the midst of *Palpalis* (according to map). From his description of this camp it was typical *Palpalis* country, beautiful scenery, with palms and thick bush right down to the edge of the river. Several flies were noticed about; on leaving this village he was away three months; he travelled northwards, and returned to the Lualaba on April 16, further down stream, and on the 18th arrived at Kakora again, staying one night. During his absence of three months from this village a young Induna and several natives who had their huts on the river bank had died of sleeping sickness. From Kakora he went to Kansanshi, near the Congo border in Northern Rhodesia, where he remained for nine months, apparently in good health, and then to Broken Hill, arriving January 6, 1911. On January 9, 1911, he had a sharp attack of fever lasting five days, with severe pains in leg and right shoulder. He remained at Broken Hill until end of month, then went to Kafue Bridge for three days and next to Livingstone, where I saw him February 13, 1911, when he was complaining of weakness and indefinite fever; he then had no temperature, and his blood gave negative results, he was treated for malaria, and as he wished to leave for Kafue he did so, promising to see me again if he did not feel better. He arrived again at Livingstone, February 23, 1911, and was admitted to hospital.

Condition on Admission on February 23, 1911.

There was a history of severe diarrhœa lasting throughout the week previous to admission. On examination the patient was found to be very anæmic, and complained of indefinite pains in his legs, with general weakness and diarrhœa. Spleen considerably enlarged and slightly tender, glands in neck were slightly enlarged on both sides, one gland only was puncturable, there was slight tremor of tongue, temperature 101° F. Miscroscopic examination of both gland juice and blood gave negative result. There was no microscopic evidence of malaria. Three days afterwards, on the 26th, trypanosomes were discovered in a stained preparation; they were scanty, only two being discovered after prolonged search. Temperature at the time blood was taken was 101° F.

Treatment.—It was thought advisable before starting specific treatment to try and control the diarrhœa, which was severe; this was found difficult, even with most careful dieting and usual medicinal remedies, and, as this diarrhœa was possibly due to the infection, trypanocidal treatment was commenced on March 6. It was decided to start treatment as recommended by Dr. Kerandel (*Sleeping Sickness Bulletin*, No. 23), and an intravenous injection of 10 cgm. tartar emetic, dissolved in 40 minims of distilled water, was given. These intravenous injections were continued every other day until twenty had been given. The first injection was followed by alarming symptoms; ten minutes after administration there was severe pain in the cardiac region, which was followed by intense dryness of the throat, a state of collapse supervening, accompanied by feeble heart-beats and small running pulse; these symptoms, however, rapidly passed off, and in half an hour the patient said he felt quite well again. None of the other injections were followed by any unpleasant results, with the exception of one near the end of the series, which was followed by vomiting and slight dryness of throat. After the unpleasant results following the first injection, which was given to the patient without any preliminary preparation, no injections were subsequently given until food had been withheld for at least twelve hours; on the occasion already referred to towards the end of series, breakfast had been taken a short time previously.

No trypanosomes were found in the blood during the time occupied by this series of injections, and for nine days afterwards, in all forty-nine days. The series was completed on March 28; on the 30th a slight sign of antimony poisoning appeared, namely, vomiting, abdominal pain and dryness of the throat; these lasted only four days, and were never marked at any time.

At this time the patient had increased in weight, and was eating and sleeping well, his temperature for a considerable period before the conclusion of the series, and for nine days afterwards, never rising above 99·5° F., his whole general condition showing evidence of the very satisfactory effects of the injections.

Unfortunately, Dr. Kerandel, in his most instructive paper on the subject of these injections, has omitted to state what signs he relied on as an indication to recommence the treatment, or what interval he allowed to elapse before doing so, and some doubt was experienced as to the proper time to start the second series. However, on April 7, ten days after the last injection, trypanosomes were again found in the blood, temperature having risen to 101° F. (being the first time it had reached this height for twenty-three days). It was then considered advisable to change the treatment, and on the 8th atoxyl 4 gr. was given intramuscularly; on the following night temperature rose to 104° F., and trypanosomes were numerous. Atoxyl 5 gr. was

repeated on the 11th, trypanosomes again found in small numbers on the 12th. On the following day, the 13th, the second series of intravenous injections of tartar emetic 10 cgm. were given, and every other day for twenty days; they had then, unfortunately, to be stopped, as all the superficial veins were occluded and considerable pain and inflammation was caused by the efforts made to enter them. On the 23rd, 26th and 30th, atoxyl 4 gr. was again given. On May 2 numerous trypanosomes were present, the temperature then being 102° F. Subsequently an intravenous injection of salvarsan was attempted, but, owing to the condition of the superficial veins, even after exposure and insertion of the needle into the vein, the fluid would not flow. From May 10 to June 6 soamin 10 gr. was injected intramuscularly, every third day, during this time, namely, on the 21st, and on May 29 trypanosomes were found.

On June 14, salvarsan 0.5 grm. was administered intravenously, this injection was followed the same evening by a temperature of 103° F. but no trypanosomes were found. A week afterwards the patient expressed a wish to leave hospital with the idea of going to Europe, arguing he was cured. He had unfortunately read a local paper in which great prominence was given to the discovery of "A Cure for Sleeping Sickness," and in which the statement was made that a West African native had been cured by a single dose of salvarsan, as a result of which it was impossible to impress upon him that such was not the case, and, as he refused further treatment, he left for Cape Town on June 20. His general condition on leavng was very satisfactory, he had gained over a stone in weight, looked far better than on admission, and his appetite for the last two months was that of a healthy man.

After an absence of nearly three months, on September 10, he returned to Livingstone from the South, and as the disease was again active he was re-admitted to hospital. Since leaving on June 20, he had received no treatment and had thus lost most valuable ground; he was not in nearly as satisfactory a condition as when he left hospital; on the evening of his re-admission his temperature rose to 101° F. and numerous trypanosomes were found in his blood, cervical glands were now quite palpable, and he had lost considerable weight.

Treatment.—At the patient's own desire a further series of tartar emetic injections was not given, and a course of treatment of soamin was decided upon ten injections of 10 gr. each being given intramuscularly with intervals of one day between; these injections were well borne and the patient stated he felt much better while they were being given, but his temperature invariably rose at night, and trypanosomes were found in his blood on two occasions during this course, which was completed on October 1. On October 3, his temperature fell to normal and remained so for four days; during this apyrexial period he volunteered the statement that his sexual desire had returned, and that this function had been in abeyance for many months; on the eighth his night temperature again began to rise, and on the twelfth another series similar to the first was commenced; after the fifth injection he complained of severe pain in the epigastric region, and an interval of four days was allowed to elapse, after which the injections were again commenced, but given every three days instead of every two. After these were completed on December 5, 0.5 grm. salvarsan was given intravenously. Quite a fortnight previous to this injection, it was very evident that patient was rapidly losing ground, night temperatures were higher, his appetite was failing, and he was becoming gradually emaciated; trypanosomes could not now be found in his blood, but there were signs to show that they had now reached the spinal fluid and brain, and his condition was rapidly becoming critical. Intravenous injections of tartar emetic were again tried, but were not followed by any good result, and were discontinued after the tenth injection. No further treatment was subsequently attempted and the patient died after going through the typical last stages of Sleeping Sickness on February 7, 1912.

Treatment in this case may be briefly summarized as follows:—

(1) Treatment by tartar emetic.
(2) Treatment by salvarsan.
(3) Treatment by soamin.
(4) Treatment by atoxyl.

Tartar Emetic.—As has been already pointed out, tartar emetic was given in the first series of injections in a comparatively highly concentrated solution, namely, 40 minims from a hypodermic syringe, the needle of which was passed directly into the lumen of the vein. This method, although no doubt effective in the administration of the drug, has many disadvantages, and caused the patient much pain and discomfort, owing principally to the unavoidable escape of small quantities of the solution into the tissues, in addition to the fact that the total bulk of the injection was necessarily small. A different method of administration was employed during the second series of injections. A Fleming's "606" apparatus was used; with this apparatus, by means of a stop-cock arrangement, a preliminary injection of normal saline can be given in order to test the whereabouts of the point of the needle, which, if not in the lumen of the vein, can be removed and reinserted until the necessary position be found; this use of saline solution in place of an irritant drug, like tartar emetic or salvarsan, in attempting to locate the position of the needle has the advantage, amongst other things, of causing no subsequent pain or discomfort to the patient. It was unfortunate that when the first series of injections was given to the patient this apparatus was not available. Had it been, it is possible that the occlusion of the superficial veins previously described would have been obviated, the injections would have been better borne, and in all probability many more could have been given with possibly as happy a result as in Dr. Kerandel's case.

Salvarsan.—The patient left hospital very shortly after the first injection was given, and so no information is available as to its results. The second was followed by no improvement to his general condition,

but at the time at which it was given it seems probable that his nervous system was already involved.

Soamin.—Although pushed apparently did very little good.

Atoxyl.—Was given on very few occasions only, as more reliance was placed on soamin as the safer drug.

Mercury, nuclein and urotropine were also given on several occasions in combination with the above, and for the relief of concurrent conditions, it cannot be said that their use was followed by any beneficial results.

The Identity of the Infecting Organism.

It was originally thought, judging from the history, that as this patient had never been in the Luangwa Valley or Nyasaland, and had lived in endemic gambiense areas, that the infecting organism was *Trypanosome gambiense*, and in order to provide the Luangwa Sleeping Sickness Commission with the gambiense strain and for comparison with the *T. rhodesiense*, on which the Commission is working, two rabbits were injected and sent up to Nawalia, the headquarters of the Commission; it has, however, recently been reported by Dr. Kinghorn, when again applying for gambiense strain for this purpose, that his reason for doing so was, that posterior nuclei which are said to be the distinguishing characteristic of the *T. rhodesiense* and on which apparently the originators of this new species of trypanosomes, Messrs. Stephens and Fanthan, have based their claim, have been found in rats inoculated from these rabbits.

We have, therefore, to accept one of two possibilities as to the nature of this infection, namely: (1) posterior nucleation is not a specific sign of rhodesiense, but occurs in gambiense; or (2) that infection with rhodesiense is not confined to the Luangwa Valley and Nyasaland, but is possible wherever *Glossina morsitans* exists, and is therefore not, as has been claimed, influenced by climatic conditions.

Although no complete summary of animal reactions of this trypanosome are at present available, the following notes on such experiments as have been done may prove of interest.

Rabbits.

Several rabbits were from time to time infected.

No. 1 on March 2; in this case numerous trypanosomes resembling gambiense were found on March 10, and on several occasions subsequently; this rabbit was sent with Dr. Kinghorn to the Luangwa Valley.

No. 2, inoculated from No. 1 on March 14; trypanosomes could not be found until March 28, when they appeared in great numbers; this rabbit died April 18 (thirty-five days after inoculation).

No. 3, inoculated from No. 2, on April 5; and trypanosomes found April 14; this rabbit died May 6.

No. 4, inoculated from No. 3, April 24; this rabbit died April 28 from an unknown cause.

No. 5, inoculated direct from patient's blood, May 1, and trypanosomes discovered on the 8th and subsequently.

No. 6, inoculated direct from patient's blood, December 23; trypanosomes not discovered until January 17, 1912; this rabbit died February 16, *i.e.*, forty-eight days after inoculation.

Goats.

A female goat which had been born and had previously lived its whole life in fly country was selected. No trypanosomes were found in the animal's blood and she appeared to be perfectly healthy. On October 9 she was injected with 0.25 c.c. of the patient's blood; no trypanosomes could be discovered until October 23, when a few were found, and on several subsequent occasions the blood was found to be swarming with them. The temperature ranged for some weeks between 105° F. and 107° F., œdema of the orbital region was present, keratitis was well marked in both eyes, more especially the left, and there was a copious discharge from the nose, weakness was progressive and extreme a week before death, the animal being unable to rise; death occurred on December 5, that is, fifty-seven days after inoculation.

It was hoped that the selection of an animal which had evidently acquired immunity from the ordinary cattle trypanosome of this country, namely, Nagana, would have been productive of more interesting results than those above recorded.

Rats.

No. 1, on November 29, a rat was infected with patient's blood; this animal did not become infective.

No. 2 was inoculated on January 27 from rabbit No. 6; trypanosomes were found on February 4 and subsequently; this rat was still alive on February 26.

No. 3, inoculated from rabbit No. 6, February 12; trypanosomes were found on the 17th and subsequently; this rat was still alive on February 26.

Repeated examination of the blood of all these animals, when trypanosomes were present both in quantity and sparsely, has failed to demonstrate the presence of posterior nucleation. In general morphology the trypanosomes differ little, if any, from gambiense.

The course of the disease in the experimental animals detailed above is rather longer than that found by other observers to follow inoculation with *T. rhodesiense*.

Clinically, the course of the disease in the patient was in no way distinguishable from the known form of human trypanosomiasis, namely, gambiense (with the one probable exception of an apparently marked resistance to atoxyl).

The researches recently conducted by the Luangwa Valley Sleeping Sickness Commission have resulted in the incrimination of *G. morsitans* as one, if not the only, carrier of *T. rhodesiense*.

The nature of the infection in the case under discussion is doubtful, *i.e.*, whether the trypanosome was *T. gambiense* or *T. rhodesiense*. The fact that in the previous history of the patient there seemed some grounds for supposing that infection had taken

place on the Lualaba River, where the disease is known to be endemic, gave rise in the first place to a diagnosis of *T. gambiense*.

The later finding of trypanosomes with posterior nuclei by Drs. Kinghorn and Yorke in experimental animals inoculated from the patient has given rise to the idea that infection did not take place in an endemic gambiense area, but subsequently through the agency of *G. morsitans*. It would be, however, premature to offer an opinion on the identity of this particular organism, pending further knowledge on the subject of whether the distinctions urged as existing between *T. gambiense* and *T. rhodesiense* will prove to be sufficient for the establishment of a new species of trypanosome, or whether the one will eventually be proved to be a modified form of the other.

ON NUMEROUS CASES OF ŒDEMA OF THE LEGS AND ALBUMINURIA OCCURRING IN A REFORMATORY, WITH A CONTRIBUTION TO THE STUDY OF BILHARZIASIS.

By E. F. Bour.

Acting Government Medical Officer, Mauritius.

Some time ago, thirty out of seventy-five boys then at a reformatory in Mauritius vomited their dinner. A few days after, some of them complained of being sick, with œdema of the legs, albuminuria, cardiac trouble, and diminution of the patellar reflex. The two last symptoms were found, in association or separately, but in few of these patients.

After having eliminated beri-beri, the diagnosis settled on alimentary toxæmia. This form of sickness daily increasing amongst the boys, the urine of every one of them, even of those apparently in good health, was analysed and albumin detected in the proportion of 55.2 per cent. of them.

On May 31, sixty-nine out of the seventy-five inmates (92 per cent.) had during the month, in different degrees, either together or separately, albuminuria and œdema of the legs; and one then came to think that to the toxæmia was to be added chloride retention.

Further investigation was made, and all the boys had their urine examined at the bacteriological laboratory, and bilharzia ova and larvæ were found in thirty-three of them (44 per cent.).

From June 1 to September 30 inclusive, forty-six boys had been sent to the reformatory, amongst whom thirteen were old offenders. Out of the thirty-three boys remaining and who were first offenders, thirteen were found to be suffering from bilharzia—*i.e.*, 39.40 per cent. Hæmaturia existed in 27.66 per cent. of all the cases.

The difference between the bilharzia cases at the reformatory in May last and amongst the boys who were sent there for the first time during the ensuing four months is so small—respectively 44 per cent. and 39.40 per cent.—that one feels justified in inferring that there have been but very few infections within the precincts of the reformatory itself, which tallies with present theories and the conditions obtaining there (good water supply—shower baths only—well-drained yard and washing place).

Though hæmaturia, undetermined as to its cause, was mentioned as being very prevalent in Mauritius by medical men of the first half of last century, our present generation of practitioners would never have placed bilharzia infection at such high figures as obtained at the reformatory, figures which give a fair idea of the bilharzia incidence in the island as a whole.

It is absolutely necessary, in order to prove the existence or not of bilharzia, to have recourse to centrifugalization of the urine, previous to a microscopic examination. This was well demonstrated by the results obtained at the bacteriological laboratory, when urine which was perfectly clear and containing but a trace and in some cases no albumin, was found to harbour bilharzia ova.

From the preceding and after full consideration, I have come to the conclusion that several factors helped to bring on the pathological symptoms observed amongst the boys—*i.e.* (1) ptomaine absorption (from salt herrings apparently sound, and given in the daily ration, as elicited by the Government analyst); (2) an over-large salt ration (18 grm. of NaCl per diem): (3) bilharzia. For it follows from our investigations that bilharzia always existed at the reformatory as at present, and the same large salt ration was dealt out formerly, and no harm apparently resulted. However, with the fortuitous incidence of an increased ptomaine absorption, coupled with the setting in of the cold weather, œdema, albuminuria, and nervous troubles cropped up. Subsequently, though bilharzia was still present, the symptoms observed disappeared almost completely, after a change of diet and appropriate treatment.

The following are some brief notes with reference to bilharziasis:—

According to Madden, the mortality from bilharziasis in Egypt is about 10 per cent., but this is the result of hospital statistics, and it is certainly below the true figures, as numerous deaths from bilharzia occur outside the hospitals.

The most generally accepted theory concerning the mode of infection by bilharzia is that it is effected without the means of an intermediate host, and is carried out by water, as water is indispensable to the hatching of the ovum and life of the larva. Also, that infection is effected through the skin. This is supported by the following facts:—

The prevalence of bilharziasis about the thermal springs of Gafsa, Tozeur and Gabès (28° to 45° C.), all of them found to contain bilharzia larvæ, and much frequented for bathing; whereas it is absent in the neighbourhood of the other thermal springs of Tunisia, where the temperature of the water ranges between 50° and 70° C., as bilharzia larvæ (miracidia) cannot survive such temperatures. (Observations of Conor, Pasteur Institute, Tunis.)

In Egypt, where bilharzia is very common, the disease affects mostly the peasant population engaged

in the cultivation of the flooded fields of the country, where they spend long hours wading and working in the water, and they also bathe in the sluggish canals and ponds to be found there. Harley, as well as Allen, writes that most of the boys bathing in the Buffalo River, South Africa, are infected with bilharzia, and the girls not, as they do not bathe there. Stock also relates that some soldiers shortly after their arrival in Africa from England bathed in an infected pond near Pretoria, and developed bilharziasis, some a month, others two months after that bath.

Bilharz's idea was that infection happened by way of the alimentary canal; but Lortet and Vialleton were unable to infect monkeys and guinea-pigs through that channel; and Looss failed with monkeys, though he had for many months given them water containing miracidia to drink. Conor showed that bilharzia larvæ cannot live in a 1—1,000 to 1—2,000 solution of hydrochloric acid; and the gastric juice containing 1—250, this may account for such failures, and why at Gasfa, already mentioned, the European population, who drink the water from the spring but do not bathe there, is not affected. Looss and Sonsino have tried in vain to infect insects, molluscs, fish and plants with bilharzia larvæ. Also, infection is not carried by way of the urethra, for Allen was unable to effect this, writes Conor, though he injected numerous bilharzia eggs through the urethra into the bladder of a man, who was carefully examined for a long time after.

These observations, coupled with the successful demonstrations of a transcuticular infection of a cat and a dog recently obtained by Katsurada and Hashegawa in the case of the *Schistosomum japonicum* —a closely related species—strengthen the probability of such a mode of infection by the *Schistosomum hæmatobium* (bilharzia).

I never found miracidia free in the urine. This is observed only when the ovum has been subjected to a traumatism, or when the urine has been collected in a vessel which was not thoroughly dry, or when some water had sojourned just long enough in the prepuce or at the meatus to act on the ova that might have been there. This, in my opinion, would do away with any theory of internal re-infection.

I also observed that when fresh urine containing bilharzia ova was kept for twenty-four hours in the incubator at a constant temperature of 37° C., these ova would not subsequently hatch out, though this happened with a sample of the same urine kept the same time at the temperature of the laboratory (25° C.). This would, I think, account for the many ova to be found in the fresh urine which will not hatch after its admixture with water, these ova having probably sojourned for some twenty-four hours in the urine in the bladder before being expelled by the act of micturition.

Four months ago an attempt was made to infect two monkeys (*Macacus cynomolgus*), one by keeping for one and a half hours in the hollow of his abdomen, closely shaved, some water containing numerous miracidia; the other, by dropping the same water into his mouth and on the mucosa of his lips and cheeks. Up to the present time no bilharzia eggs have been detected in their urine, but both monkeys thinned down, looked anæmic and lost their hair considerably. However, they now seem better and are beginning to grow a new fur. Other monkeys close by, but which were not experimented upon, presented nothing abnormal. Yoshonuto having recently obtained the fixation of the complement in the Japanese bilharziasis, having used as the antigen an alcoholic extract of the adult worms to be found in considerable numbers in infected animals, the same reaction was tried with our bilharziasis, using as antigen—as adult worms are not easily procurable—an alcoholic extract of miracidia; then of bilharzia ova many times centrifuged and washed, and lastly of bilharzia urine filtered and desiccated *in vacuo* at 55° C. The fixation was obtained, but it was of no value, as it also occurred in people free from the disease.

I have also observed that bilharzia ova, many times washed and centrifugalized with normal saline solution (8 per cent. of NaCl), and then kept in this solution for one hour in the incubator at 37° C., did not hatch. However, one sometimes sees in the field of the microscope a miracidium which is out of its shell and close to it and moving slowly. It is a traumatism which caused the hatching and the larva soon dies. The following experiments were made at the temperature of the laboratory (25° C.) and with this technique: The miracidia were obtained from fresh urine, centrifuged and washed many times with an 8 per cent. solution of NaCl, to prevent hatching during the process. Then water was added for the hatching and a drop of the mixture containing miracidia placed on a slide, with a drop of filtered water next to it, and the two joined by a liquid isthmus. After a time, the drop of pure water was full of clean miracidia, and was then quickly soaked up with filter paper and replaced by the liquid to be tried, and a coverglass laid on, with a fragment of paraffin paper at the corners and between coverglass and slide. In the saliva the miracidium lives for one hour or more, and gradually slackens its evolution till the end. This may allow for a probability of infection through the mucosa of the mouth and before the stomach is reached. In normal saline solution (8 per cent. NaCl) the miracidium lengthens and dies in one to three minutes, assuming the form of a Roman sword, with its rostrum as the hilt. I am under the impression, together with Conor, who has experimented with horse and rabbit sera, that the miracidium did not long survive when placed in normal serum; in fact, after a few minutes it became distorted and moved no more.

This, and the behaviour of the miracidium in normal saline solution, caused us to search for an aquatic cycle of the larva, preceding its entry into man. I therefore experimented with miracidia from ova many times washed, placing these in a densimetre glass, containing a Chamberland candle filter, adapted to the hydraulic vacuum which ensured the renewal of the water. These researches were of no avail. Living miracidia were never found after forty-eight hours. After twenty-four hours dead miracidia mostly were

met with, these being more or less degenerated, or else with their usual outline but no cilia. Further experiments with human serum seemed to show that bilharzia miracidia directly infect the organism.

Immersed in human serum, the miracidium moves about and gradually slackens its pace, and stops after a few minutes. Then it begins to wriggle and lengthen, and gradually, sometimes suddenly, globular buddings of a granular aspect and in clusters appear between its rostrum and body. This I believe to be the larva generating sporocysts. I counted as many as thirty of these, which sprouted sometimes on the body as well. I observed this transformation of the miracidium many times, and the last time watched it for an hour and a half during which the preparation had been placed for fifteen minutes in the incubator at 37° C.; even after this the pulsatile vacuoles were still ensuring life in the otherwise motionless organism of the larva.

These globular masses, which I believe to be sporocysts, under favourable conditions detach themselves after a time from the body of the larva which has accomplished its function, and are distributed to man through the circulatory system, to continue their cycle, and finally to end as the adult trematode.

It may also happen that a multiplication of the parasite may occur within the body, as Brumpt suggests, by means of schizogony of rediæ, or by cercariæ, which are points to be elicited. However, one is inclined to believe that multiplication is not kept up continually, and only happens with each fresh introduction of the miracidium, whilst it is going through its evolution towards the state of the mature worm.

What gives strength to my belief that this budding of the larva is but a stage in the evolution of the miracidium is the fact that I have observed it only in serum.

Prophylactic measures were enforced at the reformatory as follows :—

Disinfection of the excreta with quicklime. The floors of the buildings and the privies were washed only with soap-suds—1.25 soap in 1,000 water.

All clothing was boiled before being washed on the premises by boys not affected by bilharzia, for fear of re-infection of the bilharzic ones from their soiled clothes or skin when wet.

Bathing under the shower-bath was resorted to only after a good smear of the lower half of the body with soap-suds as above (Conor observed that a soap solution of 1—1,000 killed the miracidia); and the glans penis, both before and after the bath, was dipped in 1—1,000 perchloride of mercury, a solution which immediately kills the miracidia. Micturition whilst under the shower-bath was strictly prohibited.

As no specific has as yet been found for bilharziasis, it is possible that by warding off re-infection by strict prophylactic measures, especially self-reinfection by miracidia through the prepuce or the meatus and urethra, at the time of bathing or during the ablutions, a cure may be effected. Probably it was owing to the prophylaxis established in the reformatory that there are now only 19.4 per cent. of the boys with traces of albumin in the urine, instead of 55.2 per cent. as in May last. Besides, no ova are to be found in the urine of 30.8 per cent. of the boys who had bilharzia then.

Dr. R. T. Leiper (Helminthologist to the London School of Tropical Medicine), following on the lines of Hashegawa and Katsurada, who had experimentally demonstrated that the miracidium of the *Schistosomum japonicum* directly penetrated the skin and acquired maturity without an intermediate host, got Dr. Newham to inject subcutaneously a large number of living bilharzia miracidia into a monkey. This was done, but up to the present time no positive results have accrued. The experiment might have been unsuccessful because the miracidia found themselves in a serum medium caused by the traumatism of the injection, and immediately began to transform themselves. Direct introduction into the peritoneum might be better or placing them on the fine parts of the skin after a prolonged soaking.

I must convey my thanks to Mr. Maya, the assistant director of the bacteriological laboratory, who made some 105 examinations of urine for me besides numerous others of fæcal matter and of blood; and also for having allowed me the use of the laboratory with its collection of bulletins and reviews.

Conclusions.

Œdema of the legs and albuminuria occurred amongst many of the boys in a reformatory and were ascribed to a combination of ptomaine absorption, an over-large salt ration, and bilharzia.

Forty-four per cent. of the inmates were found to have bilharziasis and a strict prophylaxis was enforced.

Researches were undertaken concerning the ova and larvæ of bilharzia.

No evolution of the miracidium was detected in water, where it died after some forty-eight hours.

In the human serum, the miracidium threw out globular buddings of a granular aspect, which may be sporocysts.

This transformation was never observed in media other than serum.

The prophylaxis in the reformatory was directed against the infection from the miracidium through the cutis, and especially self-reinfection through the prepuce or the meatus.

It has now been established for five months, and since its beginning 30.8 per cent. of the boys who previously had bilharzia do not now show any ova in their urine after centrifugalization.

"The Australasian Medical Gazette," No. 376, vol. xxxi, No. 13, March 30, 1912.

Parasitic Protozoa.—Tidswell contributes a very interesting review of the present situation as regards infectious protozoa. He shows how the study of these parasites has increased in recent years—an increase analogous to the great advances made by bacteriology some thirty years ago. Spirochætes, trypanosomes, sporozoa and the like are all dealt with, and the paper is well worthy of careful study by those interested in protozoology.

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THE JOURNAL OF

Tropical Medicine and Hygiene

MAY 15, 1912.

THE PROTECTION AFFORDED BY TYPHOID VACCINE.

WE appeal to practitioners resident in tropical countries to report upon the effects of anti-typhoid inoculations administered to young men previous to their leaving Great Britain for the Tropics.

Many thousands of young men between the ages of 18 and 25 have been inoculated during the last few years and it is time information was collected upon the effects of this precautionary measure. In several services the inoculation is made compulsory; especially is this the case for members of the Indian Civil Service and for other branches of the public services; but many commercial firms also see to it that their young men going abroad to engage in rubber planting, tea growing, or in office work in towns are inoculated before they leave home. It may be said that there has not been time to judge of the effects, but that can hardly be advanced as a sound argument, for it is generally between the ages of 18 and 25, or in other words within one, two, or three years after going abroad, that enteric develops. There has been, therefore, plenty of time for intelligent observers to have formed an opinion on this matter, and we would beg of them to help in the matter of justification for the procedure. There are several questions requiring to be settled, or, if not capable of being settled, at least discussed. One of these is: Would it be better to defer inoculation until the young man reaches his destination, or is it advisable to continue the plan at present in vogue to administer the inoculation before leaving Britain? At first sight this may seem to amount to a quibble, or one of convenience merely; but it may not be so. Is the enteric of temperate climates identical with the tropical variety? And further, is the enteric of the tropical east and west the same ailment? The recognition of enteric is more difficult in tropical than in temperate climates. Constant examples of this are present to the mind of every medical man who has practised in the Tropics; how often has enteric run a course of a week or two before the suspicion that it is not one of the fevers "peculiar to the district" or malaria in some form, arises to one's mind; and how often consultants differ in their diagnosis over a case of suspected enteric is all too common an incident. The broad rule, that if after three days' systematic dosage with quinine the fever or the course of the disease is not affected, enteric is to be suspected, is a good, although by no means a scientific, rule to go upon. Yet the fact that enteric is possible is a safe stand-by so far as the patient is concerned, although incapability of proof may be detrimental to the acumen of the physician in some instances.

The enteric present amongst the soldiers in the recent South African campaign was regarded by not a few observers as of a different type to that met with in Britain, and the protective effect of the British vaccine administered before the soldiers landed in South Africa has not been quite satisfactorily established. Moreover a previous attack of enteric in this country did not seem to afford much, if any, protection to the South African form of the disease. A marked case of the kind occurred to a medical officer who only twelve months before leaving England had enteric, and yet shortly after going to the front was stricken with a severe attack of the disease, escaping narrowly with his life. The fact that he did escape may be attributed to his having had the disease in this country previously, but it is unusual for a second attack to develop within some twelve months.

In several parts of India the "initial fever" of young men shortly out from home is freely spoken of; it is not considered to be, nor has it been proved to be, malaria. Although, of course, malarial fever may and does attack the new arrivals, it is not to be confused with the "initial fever" which runs a course of three or four weeks and is not affected by quinine. Besides, the medical officers in India are so well versed in the diagnosis of malaria by the microscope that, were this baptismal fever dependent upon the malaria parasite, its presence would not escape their recognition. Several observers hold that the initial fever is typhoidal in its nature, and it may be they are correct in their surmise. This is also known,

that not a few of the young civil servants who, before leaving this country, have been inoculated against typhoid, nevertheless, after a few months' residence in India, may suffer from a continued fever of apparently an indefinite nature, but positively of a non-malarial type. Is this so-called "initial fever" enteric modified by protective inoculation, or is it a disease apart? The diagnosis of typhoid by laboratory investigations lacks the precision we should like to see established; and in a tropical country the much-abused condition termed "typho-malaria" cannot be wholly neglected, if only for the reason that should malarial parasites be present in the blood, still the possibility of enteric supervening cannot be set aside. We want, therefore, to have the opinion of medical men practising in the Tropics on these important questions; and even if we cannot hope to settle the question now, still evidence should be available to serve as a guide to go by in advancing our knowledge in the directions indicated. Do not allow a limited experience, say of one or two cases, to prevent an observer stating his beliefs; one case of typhoid developing in a young man previously believed to be protected by anti-typhoid inoculation immediately before going out is worth much surmise; and even if the ailment has not been capable of being proved by laboratory tests, and the evidence is not more than the "so-called" "initial fever" referred to, the evidence will be of value. Much valuable information is lost nowadays because it is considered to be merely clinical in its proofs, and the dread of committing an opinion to paper because it lacks laboratory confirmation is one of the drawbacks we have at present to contend with.

"Australian Medical Gazette," No. 372, vol. xxxi, No. 9. March 2, 1912.

Leprosy.—Ashburton Thompson gives a good summary of the recent work done on the cultivation of the lepra bacillus. He states that these advances have resulted principally from the labours of W. J. Kedrowski, University of Moscow, and C. W. Duval, professor of pathology in the Tulane University of Louisana. In addition to the names of these two Scientists, however, must be mentioned those of Professor Deycke of Constantinople, and Dr. Clegg of the Biological Laboratory, Manila, P.I. Others have recently continued the work and the mystery of the long sought for growth of leprosy bacillus has at last been solved. Ashburton Thompson's article is well worth reading.

"The Journal of the American Medical Association," vol. lviii, No. 13. March 30, 1912.

Tropical Sanitation.—Gorgas contributes a paper on Sanitation at Panama. When the United States took charge of Panama in 1904, the health conditions were very bad. Now, as everyone knows, thanks to the labours of Colonel Gorgas, the conditions are excellent. So great has been the success of the operations carried on there that Gorgas hopes that other tropical countries will follow suite, and try the same measures themselves. In concluding his article Gorgas states most emphatically that considering the results and difficulties surrounding the subject, the sanitation of Panama has not been costly. When the canal is finished, it will be able to be shown that sanitation cost about $365,000 per year. For a population of 150,000 this means an expenditure of 1 per cent. *per capita* per day for each individual, and such a sum is well within the means of any tropical country.

Annotations.

The Distinction between the Human Ankylostomes.—Balfour, in the "Wellcome Laboratory Report," second Review, 1911, p. 21, quotes a useful table of differentiation between *Necator americanus* and *Uncinaria duodenalis*. This was originally compiled by Byrd, of Florida, and is as follows:—

Necator americanus.	Uncinaria duodenalis.
Smaller.	*Larger and coarser-looking.*
Head small and finely tapering.	Head thicker and coarser.
Simple chitinous lips on buccal rim.	Four hooks on buccal rim.
Dorsal conical tooth projects well into mouth.	Does not project so well into mouth.
Sexual opening in female in anterior half.	Sexual opening in posterior third.
Caudal bursa of male smaller.	Caudal bursa larger.
Dorsal lobe subdivided.	Not divided.
Ova slightly larger.	Ova slightly smaller.

The Treatment of Bilharziasis by Salvarsan.—Day and Richards of the Kasr-el-ainy Government Hospital, Cairo, write in the *Lancet* for April 27, 1912, on the treatment of bilharziasis by salvarsan. They were led to investigate the value of this drug in the treatment of bilharzial disease; first, by the desire to test a new drug whose possibilities were as yet undefined, and, later, by seeing in various scientific and lay papers a definite assertion that it cured the disease. This claim was evidently based on a paper by Joannides, a physician practising in Cairo. The authors found that when the drug was given intramuscularly, it exerted no effect on the life or discharge of the ova, and that even though given intravenously it did not kill the adult worms. They, therefore, conclude that salvarsan as a remedy for bilharziasis is absolutely valueless, and that it should not be used or recommended for this purpose. Doctors with bilharzial cases under their care will do well to remember this.

Parasitic Protozoa in the Intestines of Healthy Men in the United States.—Eugene R. Whitmore, in the *Archives of Internal Medicine* (April 15, 1912), contributes a preliminary note on "Parasitic amœbas in the intestine of man, with a study of the protozoa found in the intestines of healthy men in the Southern United States." He concludes that as his paper is a preliminary note, it is not safe to draw any conclusions until more work is done; but the work may be summed up in a few paragraphs, the points in which seem to be justified.

(1) *Entamœba coli* and *Trichomonas intestinalis* are common parasites in the intestinal tract of healthy man in parts of Florida.

(2) The finding of parasitic amœbas and flagellates in the intestinal tract in cases of pellagra is purely coincidental. The parasites have nothing to do with the disease.

(3) It is necessary to study stained specimens of every protozoon found in the intestine of man,

before determining the species of the protozoon and the question of its connection with disease.

(4) It is very probable that *Entamœba tetragena* is the cause of at least a part of the amœbic dysentery in the United States.

Since Whitmore's paper was written he has found *E. tetragena* in the stools of two coloured persons suffering from dysentery who had always lived in America. In addition, Captain Craig has also informed him that he (Craig) had found *E. tetragena* in material from Illinois, and the same parasite has also been blamed for the production of dysentery at Rochester, Minn.

Pyelitis simulating Malaria.—Vanderhoof, in the *Journal of the American Medical Association* (April 20, 1912), writes on what he calls the pseudo-malarial types of pyelitis. He claims that the latter disease may exhibit constitutional symptoms very closely resembling those of malaria. There is no doubt that such is the case, as Vanderhoof's summary clearly shows. In this he states that forty-seven patients with pyelitis had been seen during the past five years, of whom twenty-one had been treated for malaria. The clinical features of these two affections may be almost identical. The differentiation, however, is not difficult, but the confusion of the two conditions will continue until physicians realize that quinine is a specific in malaria, and that it is useless to continue this remedy if the febrile disturbance persists. Furthermore, quinine, even in moderate doses, is irritating to an infected kidney. The constitutional symptoms of a low-grade chronic infection of the genito-urinary tract simulate pulmonary tuberculosis, but in the absence of cough the condition is often regarded as a chronic malaria. The urinary findings in these cases may appear almost insignificant, but a urine that is apparently clear on gross inspection will show the presence of a few pus-cells, often accompanied by an occasional red blood-cell. Pyelitis is the cause of many unexplained fevers, and this is especially true in the case of young children.

Careful and systematic examination of one's patients should avoid such mistakes of course, but the tendency to attribute everything to malaria in people who have ever been abroad is a tradition that dies hard.

The Cause of Malarial Anæmia.—Mary Rowley-Lawson, in the *Archives of Internal Medicine* (April 15, 1912), writes on the cause of malarial anæmia, and what she terms the intravascular migrations of the malarial parasite. She concludes, after an exhaustive research into the subject, that "the grave and rapid anæmia occurring in some malarial infections can easily be explained as due to the migration of parasites of all ages from corpuscle to corpuscle." The evidence presented in her paper, she believes would seem to justify this. "The most important fact supporting it is the frequent finding of parasites in similar stages of development: (1) Free, with varying amounts of pigment included in their substance; (2) on healthy corpuscles (corpuscles showing abundant hæmoglobin and no evidence of degeneration); (3) on corpuscles which show conclusive evidence of degeneration."

"The fact that parasites in each and every stage of development may be seen on healthy corpuscles would seem to be conclusive evidence of migration. For a parasite could not receive nourishment and secrete pigment (if that pigment be derived from the red corpuscle) and complete its life cycle on a single corpuscle without that corpuscle showing conclusive evidence of degeneration."

"The fact that young parasites are seen on corpuscles with an almost complete loss of hæmoglobin, would seem to indicate that the parasite must migrate or perish for lack of food."

Miss Rowley-Lawson further believes that still another support for her hypothesis is found in cases of multiple infection, in which three or four young parasites (sometimes six or seven) are attached to a corpuscle. She thinks that it can hardly be expected that all these youngsters can grow up on a single corpuscle, and if they are not to perish they must migrate.

Auto-erythrophagocytosis in Protozoal Diseases.—Connal in the *Journal of Pathology and Bacteriology*, vol. xvi, writes on the interesting subject of erythrophagocytosis. He states in his conclusions that the phenomenon of auto-erythrophagocytosis occurs in trypanosomiasis and in malaria, the phagocytic process being noted in some of the former cases, but not in others. As regards the latter the process was observed in some mild infections while it was absent in several cases where the parasites were very numerous. The phenomenon was more marked in quartan and malignant tertian infections than in simple benign tertian and it was also more frequently seen in mixed than in single infections. Adequate explanation of the origin of the process, Connal states, has not been supplied. The presence of a hæmopsonin is doubtful, and the experiments carried out with his first case of trypanosomiasis indicated that there was no opsonin. The theory which accords best with the facts is, that the phenomenon is connected with the acquisition of immunity. The occurrence of erythrophages in some cases of mild infection, and their absence in some cases of severe infection, their more frequent appearance in the early than in the late years of life, and the results in the cases which were not treated with quinine, all support this view. Dr. Connal believes that children in West Africa are not born with any appreciable degree of immunity to malaria, while adult natives, on the other hand, have this. Further researches on the subject are evidently required.

Multiple Cysticercus Cellulosæ Infection.—Campbell and Thomson, in the *Indian Medical Gazette* for April, 1912, report another case of multiple *Cysticercus cellulosæ* infection. They call attention to the fact that

in the June number of the *Indian Medical Gazette*, a case of multiple *C. cellulosæ* was reported from the Madras General Hospital by Dr. T. S. Tirumurti, who mentioned that previously only three cases of such an infection had been recorded in India. Considering the rarity of this infection, the authors record the following case :—

Chenappa, aged 45, male, Hindu, a native of Cuddapah district, was admitted to the London Mission Hospital, Jammalamadagu, on December 12, 1907.

History.—About six years ago patient noticed a small tumour over his left eyebrow, later, another to the left side of his nose ; still later, on his neck and all over the body.

For one year before admission patient had had a cough with purulent sputum and irregular fever.

On Admission.—The patient was admitted for his chest condition. On examination of his chest extensive tubercular disease of both lungs was found.

His sputum contained numerous tubercle bacilli. His face and body presented a remarkable appearance. Numerous small subcutaneous tumours could be seen, particularly about the neck and chest, part of back, shoulders, upper and fore arms, and thighs ; in the pectoral muscles on both sides the tumours were very numerous. The tumours were freely movable, and felt firm, and were about the size of a large grape. The patient gradually got worse and after a severe attack of diarrhœa died on January 19.

Post-mortem Examination.—Numerous cysts were found subcutaneously all over the back and part of the chest, and abdominal wall ; also over the deltoids and in upper and fore arms and thighs : a few were found in the neck and face. Numerous intramuscular cysts were found in the pectoral muscles.

Thorax.—The right lung was very adherent to the chest wall all round, the left at the apex. There was tubercular thickening of both apices and an abscess in the right apex. No cysts were found in the lungs. On the surface of the heart two cysts were found, one on the interventricular septum and the other on the left ventricle near the apex. In the left kidney there were three cysts, one on the convexity and two on the inner border. One cyst was found near the hilum of the spleen, no other cysts were found in the abdominal cavity. The cranial cavity was not examined. The patient had not allowed the authors to remove a cyst for examination, so a positive diagnosis of *C. cellulosæ* was not made till he died. When the contents of one of the cysts under the microscope were examined, the head of a tapeworm with a rostellum, consisting of two rows of hooklets, could be seen.

The pectoral muscles containing numerous cysts were sent to Dr. J. W. W. Stephens, of the Liverpool School of Tropical Medicine, who reported upon them in the *Annals of Tropical Medicine and Parasitology*, vol. ii, No. 5, May, 1909.

The Quarterly Report of the Bureau of Health for the Philippine Islands — Fourth Quarter 1911 : Victor G. Heiser, Director of Health for the Philippine Islands, in this report states that the condition of public health in the Philippine Islands at the close of the calendar year 1911 was most promising. Not only had the Bureau been able to record the most favourable year, from a sanitary standpoint, since American occupation, but it was in better position to enter upon the work of the new year than at any time heretofore. They were nearing the threshold of the time when it would be safe for commercial enterprise to make its calculations for the future, without fear that disastrous epidemics, with their attendant quarantine and other restrictions, would have to be reckoned with.

During the past year the Islands had been most seriously menaced by plague, which had prevailed in near-by foreign countries, and in several instances the disease had been brought to their shores by infected vessels. Fortunately, these were detected at quarantine, and the isolation and disinfection which was done was effective, and no spread of the disease occurred. More stringent regulations had also been made and were being enforced with regard to vessels from infected ports which lay alongside the piers, or otherwise came in contact with the shore at ports in the Philippines. A special rat-catching campaign had been started along the Manila water front, with the view of reducing the number of these rodents, and to prevent the new rat-proof wharves from becoming infested with rats from the shore side. So far, apparently, these measures had been entirely successfu

Small-pox, in the form of mild varioloid, had prevailed extensively throughout the Islands, but vaccination was so general that practically no mortality had occurred, except among newly-born children whose parents failed to have them vaccinated.

During the month of October an outbreak of cholera occurred at Bacnotan, in Union Province. Prompt measures were taken for its eradication, and these had met with complete success. From time to time suspicious cases had been reported in Manila and other places, but it had been impossible to confirm any of them by bacteriological tests, and it was reasonable to infer that they were not cholera. So far as known, the disease did not prevail in any part of the Philippine Islands.

A number of recent so-called treatments for leprosy had been tried, but none of them had proven as satisfactory or successful as the treatment with crude chaulmoogra oil and sodium bicarbonate baths. The Bureau had now at the leper hospital a number of persons who had been apparently cured of leprosy by the use of crude chaulmoogra oil, but as yet it was too early to report these cases as they were still undergoing treatment and it was believed that a period of at least two years should elapse before an opinion was ventured as to whether they were permanently cured.

Considerable work had been done in the past year by the Bureau of Science in connection with studying the amœbæ in the Manila water supply, with the view of being able to state definitely whether the amœbæ found therein would have to be regarded as

pathogenic or whether they could be regarded as non-pathogenic. It was not deemed advisable to recommend a system of filtration until this question could be definitely answered. Experiments made with the ultra-violet rays for sterilizing water had been very successful on a small scale, and it was now the intention to try a plant of a larger capacity with the hope of being able to determine whether such a method might be used successfully for sterilizing the Manila water supply.

A study of this report shows that great progress has been made as regards the sanitation of the Philippines, and the future, as Heiser puts it, is distinctly a bright one.

Abstract.

THE ALLEGED HETEROGONY OF THE ANKYLOSTOMA.*

By Professor A. Looss.

THE view that *Agchylostoma duodenale* is capable of developing outside the human body into a generation of sexual animals—a form of development usually designated heterogony, heterogenesis, or, sometimes, dimorphobiosis—has been defended by various writers up to quite recent times, and is apparently not even yet altogether given up. The reason of this probably lies in the circumstance that the hypothesis is supported by a large number of observations confirmed from various quarters. Now, if there is no heterogony in the life of the ankylostoma, it is clear that either the respective observations must be incorrect, or else their interpretation. Since it is hardly conceivable that different and thoroughly conscientious authors should all have made the same or similar mistakes; the only alternative left is that the error lies in the interpretation of what was observed. I shall now try to show that this is indeed the case.

It is perhaps best to begin with a short explanation of what is meant by heterogony. Its distinctive character is that one and the same species of animal appears in two forms, which differ both in outward aspect and internal structure, while living under different external conditions and also reproducing themselves in a different manner. Among the parasites of man there is one such heterogenetic form; it was formerly known by many different names (*Rhabditis stercoralis*, *Anguillula intestinalis*, *Pseudorhabditis stercoralis*, *Rhabdonema intestinale*, *Strongyloides intestinalis*, and others), but owing to the rules of nomenclature now in use must henceforward bear the name "*S. stercoralis* (Bavay)." One form of this *Strongyloides* lives parasitically in the human intestine. The adults all have the external appearance of females, but are in fact not true females inasmuch as their sexual organs, although of the female type, yet have no copulatory parts and produce germinal cells which become transformed into eggs and develop into young worms without previous fertilization. The adults are therefore asexual, despite their likeness to females, and represent the form originally described as *A. intestinalis*. The eggs they produce commence their development while still in the body of the mother; being discharged from this sooner or later, they go on developing in the intestine and finally hatch so that in freshly evacuated stools they regularly occur as free young worms. These are the original *R. stercoralis* of Bavay and represent the second form under which the species appears; they are distinguished from the first by the following characters: they do not again become parasites, but attain their full development in the fæcal matter surrounding them, and do not remain asexual, but transform into separate males and females with complete sexual organs.

These sexually mature stages show in their organization a great resemblance to certain free-living nematodes which pass their whole life in damp earth impregnated with decaying organic matter, and so long as external conditions—such as temperature, air, moisture, food, &c.—permit multiply without interruption. They were formerly in the genus *Rhabditis*, a distinctive character of which is the peculiar form of the œsophagus. When later researches into the development of the parasitic nematodes revealed the fact that a similar configuration of the œsophagus was also to be found (though, it is true, only for a time) in their young stages, it became customary to speak of "Rhabditis stages" of the respective parasite species. In this case, therefore, the word "Rhabditis" no longer means a genus in the systematic sense, but, in the sense of comparative biology, a stage in the life-history characterized by a particular form of the œsophagus. The descendants of the parasitic form of *S. stercoralis* thus have a "rhabditis shape" and develop in the fæces in which they were discharged from the host into males and females, the former recognizable by their more or less curved posterior end with the two short brown spicula, the latter by their straight, pointed posterior end and the eggs within the body. These sexual stages copulate and produce eggs which, by young females, are laid, *i.e.*, evacuated from the body, while in old females they remain and develop into larvæ within the uterus. In either case, they yield larvæ which at first again present the rhabditis shape and exactly resemble the early stages of their parents, *i.e.*, the "*R. stercoralis*" Bavay. They do not, however, again develop, like these, into free-living sexual animals, but soon lose their rhabditis shape, the triple division of the œsophagus becoming effaced, while the length of the organ increases considerably: the body also elongates as a whole, but the primordium of the genital organs remains small; in a word, the rhabditiform larvæ become transformed into the so-called "filariform" larvæ. These do not forthwith change any more, although they may remain alive for months. They only find suitable conditions for their further development in the human body, where they re-transform into the original parasitic and asexual stage.

* From "Records of the School of Medicine," Cairo, vol. iv, pp, 252-276.

This is the form in which the life-history of *S. stercoralis* is usually described. There are, however, certain deviations from it. They consist in the fact that the rhabditiform larvæ which first appear in the stools of infected persons do not all develop into sexual animals, but a larger or smaller percentage by a simple metamorphosis at once assume the filariform shape. This remarkable behaviour may be observed even among larvæ contained in one and the same stool. It aroused the interest of the earlier authors, especially Grassi and Leichtenstern, who experimentally tried to trace it back to variations in the external conditions (air supply, food supply, temperature, relative moisture, &c.), without, however, obtaining any positive results. The researches, on the contrary, left no doubt but that the special course of the development was an inherent character of the individual larva, and the only fairly safe conclusion to be arrived at was that the *Strongyloides* indigenous in warmer climates appeared to be specially prone to form the sexual generation, while that indigenous in cooler climates chiefly developed by simple metamorphosis. My own investigations made in Egypt with three different species of *Strongyloides* led to results similar to those of the earlier authors; in all three species sexual individuals developed in a larger or smaller proportion, but at all times, and in all cases, direct transformation of the rhabditiform into the filariform larvæ was also to be observed. Like Grassi and Leichtenstern, I have never, by any variation of the external conditions, succeeded in bringing about perceptible modifications in the course of the development of the larvæ; this development is therefore not suddenly altered by external agencies.

The real meaning of the difference at issue must, I think, be sought in another direction. The fact of the direct transformation of the rhabditiform into the filariform larvæ is a sign that, in the natural course of events, at least two, but probably even more asexual generations immediately follow one another, just as is the case in plenty of other examples of heterogony. The number of these asexual generations may vary in accordance with the principle found out by Leichtenstern; that is to say, in warmer regions there seems to be a fairly regular alternation between a sexual and one or a few asexual generations, while the number of the latter increases as the climate becomes cooler. Whether, therefore, an individual larva will develop into a sexual stage or simply undergo metamorphosis will depend, apart from the locality, on the number of generations which separate it from its last sexual ancestors. I cannot believe that the latter should be entirely suppressed even in cooler climates. In order to prove this, we would have to show that the descendants of any directly metamorphosed larva retain this metamorphosis, generation after generation, without ever assuming the sexual form. The practical difficulty of such experiments will become obvious if we remember that the asexual generations are parasitic. However, whether the number of these latter be large or reduced to one, the life-history of *S. stercoralis* remains a heterogony, for it presents the distinctive characters of this mode of development in the occurrence of individuals which differ from one another in their internal organization, their form of reproduction, and in their manner of life.

The first statements that such heterogony occurs in the life-history of *Agchylostoma duodenale* are those of Leichtenstern (1886). I will quote here the passage in which he made known his apparent discovery. "By observing suitable culture methods which will be described later, a free-living, sexually mature rhabditis form, reproducing itself through unlimited generations, was successfully cultivated from the eggs and larvæ of ankylostoma; a form which is essentially distinct from the parasitic ankylostoma, and also sharply and surely distinguished by certain peculiarities from all species of *Rhabditis* hitherto described. I foresee with certainty that my observation, being that of an 'outsider.' will not at once be accepted by professional zoologists, but rather be received with careful reserve and incredulity. Although the cultivation of the sexually mature form succeeded only in in the fæces of patients suffering from ankylostomiasis, and garden earth or clay, which are known to be very unsuitable for the purpose, were never added to the cultures, stress will rightly be laid on the possibility of accidental pollution of the cultures by free-living nematodes, especially by one of the many species of *Pelodera* or *Leptodera* which occur in decaying matter. Perhaps it will even be suggested that I could have been deceived by *R. stercoralis* (Leuckart), the free-living generation of the parasitic *A. intestinalis*, which is occasionally found associated with ankylostoma in the intestine. I am in a position entirely to dispose of all such doubts and objections, which have repeatedly arisen in my mind during the course of researches which have now lasted for months in favour of the statements above made."

In these words, Leichtenstern announces his alleged discovery of the heterogony of the ankylostoma; in the very same year, however, he found it necessary, because of new experiments made in the interval, to retract his statements. I quote this passage, again verbally, so far as this is possible: "Up to the present time, this rhabditis has exclusively been found in the fæces of brickmakers infected by ankylostoma; numerous fæces from patients suffering from other diseases, and more especially the fæces of navvies, have been tested always without any positive result. Since, further, it was not until four months after the beginning of these experiments that I suddenly found males in a culture, I took the sexually mature hermaphroditic form for descendants of the ankylostoma larvæ, *i.e.*, for their free-living, sexually mature rhabditis-like generation developed through heterogony. The more so since, despite incessant observation of the cultures, I did not, before the first appearance of the Rhabditis larvæ that so extraordinarily resemble the adult ankylostoma larvæ, thus far succeed in meeting with those characteristic eggs and embryos which, as descendants of the sexually mature females, are always found in great numbers in the later cultures of these Rhabditidæ. This view to which I recently gave expression, not lightly but after

months of hesitation and persevering continuous experiments, I find myself to-day compelled to withdraw, on account of feeding experiments made in the interval."

No one who reads the two passages quoted will be able to say that Leichtenstern put forward his original statement carelessly and without being thoroughly convinced of the absolute correctness of his observations, and yet, soon after, a single new observation sufficed to altogether upset his earlier conviction. After Leuckart had proved the direct development of the *Uncinaria criniformis*, it was quite safe to assert on the ground of general zoological and helminthological experience that the development of *A. duodenale* would take the same course; or that, if the latter actually were heterogonous, that heterogony must also occur in the case of *U. criniformis*.

Supreme personal confidence in his method of research, and neglect inspired by this confidence of the biological probabilities pointed out by specialists on the subject, were the reasons which made it possible that Leichtenstern was deceived. It is fortunate in the interests of the advance of science that he soon convinced himself that he was in the wrong; for where personal convictions play the most prominent part it is not always easy for impersonal reasons, brought forward by others, to gain a hearing. By Leichtenstern's own recantation the question of the existence or non-existence of heterogony in *A. duodenale* became settled in German literature.

In French, Italian, and American literature the question has, so far as I know, not led to divergence of opinion. In English literature, on the contrary, it has given rise to lively discussion lasting even up to very recent times (1910). While some authors consider the heterogony of the ankylostoma as actually proved, others as decisively deny its existence, and the rest do not apparently quite know which of the two views they ought to acknowledge as correct.

Report.

THE INDIAN GENERAL MALARIA COMMITTEE.*

THE second meeting of the General Malaria Committe was held in Bombay on November 16 and 17, 1911, and was attended by the following delegates:—

The Honourable Surgeon-General C. P. Lukis, C.S.I., M.D., F.R.C.S., *President*.

Captain A. G. McKendrick, Statistical Officer with the Government of India, Sanitary and Medical Departments, *Secretary*.

India 3.

(1) The Honourable Mr. L. C. Porter, I.C.S., Secretary to the Government of India, Department of Education.

(2) Kunwar Maharaj Singh, M.A., Barrister-at-Law, Assistant Secretary to the Government of India, Department of Education.

(3) Mr. F. M. Howlett, B.A., second Imperial Entomologist, Pusa.

Ceylon 1.

(4) Dr. C. J. Rutherford, Assistant Principal Civil Medical Officer, Ceylon.

Madras 4.

(5) Surgeon-General W. B. Bannerman, M.D., I.M.S., Surgeon-General with the Government of Madras.

(6) Captain W. A. Justice, M.B., D.P.H., I.M.S., Officiating Sanitary Commissioner, Madras.

(7) Mr. W. Hutton, A.M.I.C.E., Sanitary Engineer, Madras.

(8) Captain W. S. Patton, I.M.S., Officiating Director of the King Institute of Preventive Medicine, Madras.

Bombay 8.

(9) The Honourable Surgeon-General R.W.S. Lyons, M.D., I.M.S., Surgeon-General with the Government of Bombay.

(10) Mr. J. P. Orr, B.A., I.C.S., Chairman, City of Bombay Improvement Trust.

(11) Lieutenant-Colonel T. E. Dyson, M.B., C.M., D.P.H., I.M.S., Sanitary Commissioner, Bombay.

(12) Mr. E. G. Turner, M.A., I.C.S., Officer on special duty in connection with the Development of Salsette.

(13) Major W. G. Liston, M.B., I.M.S., Director, Bacteriological Laboratory, Bombay.

(14) Major F. H. G. Hutchinson, M.B., I.M.S., Deputy Sanitary Commissioner for the Southern Registration District, on special duty in connection with the experimental Sewage Installation in Poona City.

(15) Mr. Mandy, C.E., Sanitary Engineer, Bombay.

(16) Mr. Nanjundayya Belwadi, I.C.E., Sanitary Engineer, Bombay.

Bengal 6.

(17) Major W. W. Clemesha, M.D., I.M.S., Sanitary Commissioner, Bengal.

(18) Mr. G. B. Williams, Sanitary Engineer, Bengal.

(19) Rai Kailas Chandra Bose Bahadur, C.I.E.

(20) Major A. B. Fry, Special Deputy Sanitary Commissioner for Malaria.

(21) Assistant-Surgeon Upendra Nath Brahmachari, M.A., M.D., D.P.H. (Calcutta), Teacher of Medicine, Campbell Medical School, Calcutta.

(22) One Member of the Bengal Malaria Committee.

United Provinces 2.

(23) Major J. C. Robertson, I.M.S., Officiating Sanitary Commissioner, United Provinces.

(24) Captain J. D. Graham, I.M.S., Special Malaria Officer, United Provinces.

Punjab 3.

(25) Lieutenant-Colonel E. Wilkinson, F.R.C.S., D.P.H., I.M.S., Sanitary Commissioner, Punjab.

(26) Lieutenant-Colonel S. Browning-Smith, I.M.S., Chief Plague Medical Officer, Punjab.

* From *Paludism*. "The Transactionsof the Committee for the Study of Malaria in India." No. 4, March, 1912.

(27) Lieutenant-Colonel J. R. Adie, M.B., I.M.S., Chief Malaria Medical Officer, Punjab.

Burma 1.

(28) Major N. P. O'German Lalor, I.M.S., Special Malaria Officer, Burma.

Eastern Bengal and Assam 2.

(29) Lieutenant-Colonel E. C. Hare, I.M.S., Sanitary Commissioner, Eastern Bengal and Assam.

(30) Dr. C. A. Bentley, M.B., D.P.H., D.T.M., & H., Special Deputy Sanitary Commissioner, Eastern Bengal and Assam for Malaria.

Central Provinces 2.

(31) Major T. G. N. Stokes, I.M.S., Sanitary Commissioner, Central Provinces.

(32) Major W. H. Kenrick, I.M.S., Special Malaria Officer.

The agenda was arranged as follows:—

1*st day* (*a*), Introductory remarks by the President.

(*b*) Information and discussion regarding the agency for the study of malaria in the several provinces.

(*c*) Information and discussion upon the scientific results that have been obtained since the last meeting of the General Committee, and in particular results that have been obtained with regard to the various problems enumerated in Appendix II, on p. 11 of *Paludism* No. 1, and on p. 13 of No. 2.

2*nd day* (*a*), Additional papers upon the subjects mentioned on pp. 14 and 15 of *Paludism*, No. 3.

(*b*) Information and discussion upon the measures that have been taken for the prevention and mitigation of malaria.

After some discussion the following resolutions were unanimously carried:—

(1) This Conference is of opinion that researches by experts in the field, such as those carried out by Christophers and Bentley, prove the value of preliminary scientific investigation, and seem to point to the probability that anti-mosquito measures may not prove so costly as was at one time feared.

(2) The Conference believes that no one measure can be suitable for all the conditions that favour the prevalence of malaria; that quinine prophylaxis applied to a free population is difficult to carry out in the thorough way necessary for success; and that a combination of several measures may be required as local circumstances may indicate. The Conference is of opinion that notwithstanding the difficulties of quinine prophylaxis it cannot be too strongly emphasized that, under the peculiar conditions of the Indian populace, arrangements for the treatment of quinine of those sick from malaria is a matter of primary importance from the point of view of saving life, of preventing suffering, and of destroying a potent source of infection.

(3) The Conference desires to call the attention of Government to the possibility of danger arising from borrow pits in the proximity to human habitation, especially when such excavation would result in stagnation of water therein.

(4) The Conference is of opinion that the education of the people is a most important anti-malarial measure and that every effort should be made to secure the co-operation of the public without which there is little hope that the campaign against malaria will ever be crowned with success. They believe that instruction in schools as well as lectures and lantern demonstrations in villages and towns are the best methods of propagandism and that in this way information is more likely to reach the people than by the publication of pamphlets and posters.

(5) The Conference while strongly recommending the prosecution of further research is of opinion that although expert investigation is still necessary, enough is known as to the breeding habits of mosquitoes, &c., to make it frequently possible for trained workers to deal with malaria in an efficient manner.

(6) In view of the possibility of the importation of yellow fever into India, the Conference suggests the advisability of a careful "stegomyia" survey and of the education of the public in the matter of destruction of domestic mosquitoes.

Notice.

THE INCORPORATED LIVERPOOL SCHOOL OF TROPICAL MEDICINE.

ADVANCED COURSE OF INSTRUCTION.

SUMMER term, June 1 to 29, 1912. Fees for the full course of instruction four guineas. Microscopes and instruments: A student requiring the use of a school microscope will be charged five shillings, and for the use of other instruments a returnable deposit must be made with the clerk of the laboratory. Certificates: A certificate will be given at the end of the course to students approved by the professional sub-committee.

SYLLABUS.

(*a*) *Entomology* (Professor R. Newstead; Assistant Demonstrator, Mr. H. F. Carter). This course will consist of a series of systematic lectures and practical demonstrations on: (1) The morphology, the generic and specific characters, and the life-history of the more important insects and ticks concerned in the dissemination of disease in man. (2) Practical instruction in the methods of collecting and preparing specimens for microscopical study. Each student will receive individual instruction in the laboratory by the Professor and his Assistant Demonstrator. The extensive collection of the blood-sucking insects and ticks will be available both for study and reference.

(*b*) *Helminthology* (Dr. J. W. W. Stephens, Walter Myers Lecturer in Tropical Medicine). The course will consist of demonstrations, with short explanatory lectures on: (1) Methods of collecting, fixation, staining, clearing and cutting serial sections of entozoa. (2) Detailed anatomical study of selected genera and species in man and of allied forms in animals

(3) Methods of cultivation, experimental transmission and study of larval stages of entozoa.

(*c*) *Protozoology* (Dr. H. B. Fantham, Assistant Lecturer in Parasitology). The course will consist of short explanatory lectures, with demonstrations on: (1) Special methods of fixation and staining of protozoa, both in smears and sections. (2) Detailed study of selected examples of amœbæ, flagellates, sporozoa, spirochætes, &c. Subjects such as the trypanosomes and flagellates of insects, avian coccidia, microsporidia of insects, the spirochætes of molluscs will be considered. (3) Methods of cultivation of the protozoa.

Notes and News.

THE first research expedition (for the study of malaria) from the Department of Tropical Medicine and Hygiene, of Tulane University, which department is under the direction of Professor Creighton Wellman, sailed from New Orleans, April 20, for central America. The expedition is headed by Dr. Charles Cassedy Bass, of the Department of Tropical Medicine and Hygiene of Tulane. From Central America the members of the commission will sail directly to New York to attend the meeting of the American Medical Association, before which it is intended to announce and exhibit the results of the investigation.

Drugs and Appliances.

MESSRS. J. D. RIEDEL AND CO., 54, Cannon Street, London, E.C.—Mergal (mercury cholate) as prepared by Messrs. Riedel, is an organic mercurial salt for the internal treatment of syphilis. Each capsule of mergal contains 0·05 of mercury cholate, and 0·1 of tannate of albumin. It is recommended in giving this preparation that the intermittent plan of treatment be followed, namely, full and smaller doses alternating, say, every two months. Treatment of syphilis by injection, inunction, baths, &c., have certain advantages, but they are apt to, and do, delude the patient that a few injections, inunctions, &c., suffice. This is a great misfortune from an individual and a national point of view; only by a prolonged dosage of mercury is it possible to eradicate syphilis, and in no other way can patients be persuaded to continue this except by giving mercury by the mouth. Mergal fulfils all the requirements necessary in the treatment of syphilis.

MESSRS. MENLEY AND JAMES, Farringdon Road, London.—The "malt-glidine" preparation, introduced by Messrs. Menley and James, is rapidly and deservedly growing in favour.

MESSRS. OPPENHEIMER, SON AND CO., 179, Queen Victoria Street, London, E.C. — Of several useful preparations brought forward by Messrs. Oppenheimer, we would mention (*a*) Acetosal, which is a purified aceto-salicylic acid in the condition of an amorphous powder. This remedy is specially efficacious in acute rheumatism, and in those who regularly suffer from subacute attacks. Acetosal passes through the stomach unchanged, and is broken up in the intestine when salicylic acid is liberated. In this way the gastric disturbance, so commonly met with when the salicylates in salicylic acid are administered, is avoided. (*b*) Pulticine is a convenient form of poultice. It has none of the disadvantages of the old-fashioned linseed-meal poultice, and is mildly antiseptic, readily prepared, and comforting to the patient. (*c*) "Hordine," a liquid barley malt, possesses the advantage over other malt preparations of being easy and pleasant to take from the fact of its being liquid. "Hordine" is put up plain, or with Easton's syrup, or with glycerophosphates, or with Parrish's food.

MESSRS. W. G. LACY AND CO., Cornwall Road, Fulham, London, S.W.—To their well-known Formalin Lamp, so widely used for disinfectant purposes, Messrs. Lacy and Co. have added a water jacket for the purpose of providing the necessary amount of dampness to further the penetrative and sterilizing effects of the formalin vapour. The simplicity of the "Lacy's Formalin Lamp," its efficiency and portability, have served to bring disinfection by its means into widespread favour.

MESSRS. ALLEN AND HANBURY, Plough Court, Lombard Street, London, E.C.—"Byno" Hæmoglobin is gradually supplanting several of the "medicinal-food preparations now on the market. "Bynin" is a pure active liquid malt, and gives the preparation a malt flavour which is always pleasant. Hæmoglobin contains many of the important elements of the blood, amongst which iron is conspicuous. During convalescence from serious ailments, in anæmia, and faulty absorption of the food, "Byno" hæmoglobin is of real value.

Obituary.

WE regret to announce the death of Dr. Paul G. Freer, which took place at Begnio, Philippine Islands, on April 17, 1912. Dr. Freer was born in Chicago on March 27, 1862, and graduated from Rush Medical College and the University of Munich. In 1905 Dr. Freer was appointed Director of the United States Scientific Bureau, in the Philippine Islands, and in 1906 he was also made Dean of the Philippine Islands Medical School. As an editor of the Philippine Journal of Science, Dr. Freer's name was well known to tropical workers, and tropical medicine has sustained an undoubted loss in his early demise.

Personal Notes.

COLONIAL MEDICAL SERVICES.

West African Medical Staff.

No deaths.

Resignation.—J. Cross, M.B., Ch.B.Glas., Medical Officer, Southern Nigeria.

Retirement.—A. J. A. Browne, L.R.C.P., L.R.C.S.Ireland, Medical Officer, Southern Nigeria, retires with a gratuity.

Transfers.—J. Lunn, M.B., C.M.Glas., Medical Officer, Gold Coast, has been appointed an Itinerating Inspecting Officer in the Medical Department of Ceylon.

New appointments.—M. Groves, L.M.S.S.A.Lond., and F. G. Thompson, M.B.Lond., to be Medical Officers, Gold Coast; W. Browne, L.R.C.P., L.R.C.S.Edin., L.F.P.S.Glas., to be Medical Officer, Southern Nigeria; W. C. E. Bower, L.M.&S. Madras, M.R.C.S.Eng., L.R.C.P.Lond., to be Medical Officer, Sierra Leone (re-appointment).

Other Colonies and Protectorates.

H. G. Holdbrook, M.B., B.Ch., B.A.O.Dublin, N. W. Steinberg, M.B., Ch.B.Liverpool, W. A. Taylor, M.B., B.Ch., B.A.O. Dublin, and J. A. McIlroy, M.R.C.S.Eng., L.R.C.P.Lond., to be Medical Officers, Straits Settlements; H. W. Tilling, M.R.C.S. Eng., L.R.C.P.Lond., to be Medical Officer. Gilbert and Ellice Islands.

Correspondence.

To the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

DEAR SIRS,—I should be glad if you would draw the attention of your readers to the little invention enclosed herewith, called an Earclip. The object of it is to close the

tragus of one or both ears in such a manner as to exclude slight noises without preventing access of all sound to the ears. It was made by me more than twenty years ago for a patient who was very susceptible to such noises, and since then has been frequently used by myself when travelling or when engaged in hard literary work, &c. Messrs. C. Baker, of 244, High Holborn, London, have kindly put the invention on the market, as you will see by the enclosed prospectus. My object in having it put on the market was to help medical men in the treatment of patients susceptible to noise, but I believe that the instrument will be useful to many people who use it with intelligence, especially in the Tropics.

Yours faithfully,

R. Ross.

The Incorporated Liverpool School of Tropical Medicine.
March 11, 1912.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"The Journal of the American Medical Association," vol. lviii, No. 16, April 20, 1912.

The Germicidal Action of Basic Fuchsin.—May, Clinical Instructor in Surgery in the Medical Department of the University of Cincinnati, finds, as a result of investigations carried out by himself, that basic fuchsin is a germicidal agent which is more powerful than phenol (carbolic acid), and one which has a greater diffusibility and is less toxic.

From clinical observations he also believes that it has a marked stimulative action on epithelial and granulation tissue growth. He has not had, so far, experience with it in the treatment of lupus and blastomycosis, but hopes soon to be able to try it.

"Journal of the Royal Army Medical Corps," vol. xviii., No. 3, March, 1912.

Malarial Carriers.—Major Stammers and Captain Davys in an article on "Apyrexial Malaria Carriers" point out the importance of such cases. The apyrexial malaria carrier, they say, is not very generally recognized as a means of the propagation of malaria, although from time to time certain investigations have shown that the disease may be spread by such carriers. The condition is a peculiar one in that the apyrexial carrier may never have had, so far as can be ascertained, any attack of malaria, may be in perfect health and apparently quite fit in every way to do full military duty, and yet be found to be harbouring the sexual forms of the parasite in the peripheral circulation. In support of this statement the authors give the details of an examination of the 2nd Battalion of the Royal Irish Fusiliers at Quetta in 1911, the regiment having come to that place from Ferozepore at the end of November, 1910:—957 men were examined, and out of that number 124 were found to be carriers, all these at the time doing full military duty, while in many instances no history of previous malaria could be elicited. A fact that had been previously observed, the authors state, was confirmed—namely, that the taking of quinine in prophylactic doses had no effect on the condition. Such carriers are found in other parts of the world as well as in India and the subject is one of great importance, especially as regards the prophylaxis of malaria.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

CELL INCLUSIONS IN THE BLOOD OF BLACKWATER FEVER AND OTHER TROPICAL DISEASES.

By GEORGE C. LOW, M.A., M.D.
Lecturer, London School of Tropical Medicine.

I WAS very much interested in reading Lieutenant-Colonel Sir William Leishman's paper on "Cell-inclusions in the Blood of a Case of Blackwater Fever," a paper published in the *Journal of the Royal Army Medical Corps*, May, 1912 (vol. xviii, No. 5), and that especially so as I have within the last few years seen the same or very similar inclusions in white blood cells, firstly in the blood of cases of fever from Borneo and secondly in the blood of pellagra cases brought by Dr. Sambon from Italy.

As regards the cases from Borneo, their history is as follows: Some years ago Dr. Conyngham returning from that island brought with him many films of blood from cases of fever and other diseases, and in some of these he said he thought he had found a new parasite contained within the white cells.

A careful study of these showed what were apparently masses of chromatin, generally of a small size, contained in the protoplasm of some of the leucocytes. As far as one can remember now these inclusions were by no means numerous, they were chiefly in the large mononuclear cells and by their staining reactions they certainly appeared to consist of chromatin. The films had been stained by Giemsa's method. Dr. Conyngham was specially struck by the fact that all the films in which these bodies were found came from cases of fever in which prolonged and repeated examinations of the blood never revealed any malarial parasites (no quinine taken), and he thought that it might be a special febrile disease having as its causative agent the bodies in the leucocytes. Before eventually deciding I advised Dr. Conyngham to get more films of blood from similar cases when he returned to Borneo, but this he never did, and so the observation remained unpublished. The cases, of course, were not ones of blackwater fever and had never suffered from that complaint. The incident became more or less forgotten till Sir William Leishman's coloured plate with his cell inclusions brought the matter again to one's mind and recalled the similarity of the bodies seen in the films from Borneo.

The second time cell inclusions were encountered was, as has already been stated, in the blood of pellagrins brought by Dr. Sambon from Italy. These bodies or inclusions were met with when doing differential leucocyte counts of different pellagra bloods and were sketched at the time, a note being appended that they looked unusual. Drs. Sambon and Chalmers, it will be remembered, have described a cell inclusion probably of the nature of a *Chlamydozoa* in material taken from the brain and spinal cord of pellagra cases, and before that observation was published I showed Dr. Sambon the sketches of the peculiar looking chromatin masses seen in the leucocytes by myself, but we concluded that they did not seem to bear any close resemblance to the bodies seen by him and Chalmers in the brain. If further work demonstrates the constant presence of their bodies, however, the possibility of these chromatin inclusions in the blood being a phase or stage of them might have to be entertained.

After having carefully studied the plate illustrating Sir William Leishman's article, as already described, one was at once struck with the similarity existing between the bodies seen by him in the white cells in his case of blackwater fever and some chromatin inclusions seen in a large mononuclear, or possibly an endothelial cell, in one of the cases of pellagra studied. The cell (fig. 1) is evidently of the same type as the cells in his plate, and the two little chromatin nodules or masses are very similar. The pen-and-ink sketch does not bring out the details so well as a coloured plate, but the two little inclusions took on a deep red colour with the Leishman's stain used,[1] the nucleus of the cell being much the same colour, while the protoplasm stained light blue.

They certainly seemed to consist of chromatin, and their centre was more faintly stained than their periphery, giving one an impression of a ring-shaped structure, though this does not appear in the sketch.

In addition to this peculiar cell, with its two inclusions, another leucocyte of the lymphocyte type was seen to have ten chromatin dots (? inclusions) in its protoplasm (fig. 1, 2). These dots were small, but

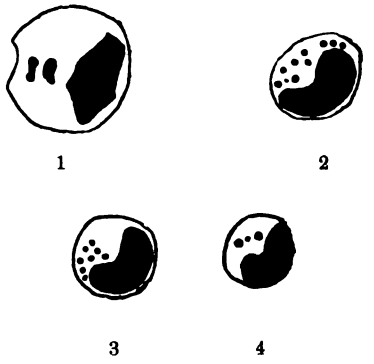

FIG. 1.—PECULIAR LEUCOCYTES SEEN IN CASES OF PELLAGRA CONTAINING CHROMATIN INCLUSIONS AND DOTS.

Description.

1 and 2 from the same case.
1. A large mononuclear cell with two chromatin inclusions.
2. A lymphocyte with ten chromatin dots in its protoplasm.
3 and 4 from another case.
3. With eight chromatin dots in its protoplasm.
4. With three. Protoplasm pale blue.

very distinct, sharply defined and took on the chromatin staining very clearly. Whether they represented anything parasitic or not is not very clear, but at any rate two similar cells were seen in the blood of another case (fig. 1, 3 and 4). Here

[1] It is right to state, however, that the Leishman's staining was prolonged, the mixture of water and stain being left on for half an hour instead of the usual five minutes. This procedure was adopted in order to look for possible spirochætes, but no such parasites were found. Sir William Leishman's bodies, it will be noted, appeared after prolonged staining also, *vide* his paper.

again, as the sketch shows, similar little chromatin dots are scattered about in the protoplasm of the cells, the protoplasm in these instances being of a pale blue colour. The nuclei of the cells, numbered 2, 3 and 4 in the diagram, took the chromatin stain very deeply, being deep purple in colour, the type of the cell being that of the ordinary small or intermediate lymphocyte.

Cells with such inclusions were rare. In some of the films examined they were not seen at all, while in others one or two might be seen, but in certain instances were so indefinite as not to be specially recorded or sketched. Cell No. 1, fig 1, was much the most distinct of the large mononuclear or endothelial type seen, cells 2, 3 and 4 being well marked examples of the other type.

As Sir William Leishman remarks, What is the possible nature of these cell inclusions? It is somewhat difficult to decide, but one of his suggestions that they are products derived from changes in the nuclei or cytoplasm of the cells seems as probable as anything else. On the other hand it is possible that they may be parasitic, parasites of the chlamydozoa or some other undescribed group, and such an eventuality has to be borne in mind. The finding of apparently similar bodies in the different diseases mentioned, though perhaps tending to show that they are derived from the cell itself, does not necessarily dispose of the idea that they might be parasitic. Analogy shows that parasites, though morphologically identical, or at least very similar, may yet be specifically distinct and cause quite different diseases (*Leishmania tropica* and *L. donovani*, for example), and so these cell inclusions may yet be proved to be different and in some way or other connected with the disease in the blood of which they have been found.

As regards the type of cell found by Sir William Leishman in the films of the blackwater fever case described by himself, these are not absolutely characteristic of that disease. They occur also in some malarial patients who have never suffered from blackwater fever before nor have developed it later. It is quite possible that they may be endothelial in nature, but when met with in the ordinary course of doing differential counts, they are usually talked of as large mononuclear cells. It is a disputed point with many as to what constitutes a large mononuclear cell and the nomenclature of the white cells really requires revision. Personally, my own experience goes to show that cells of this endothelial type are not uncommon in many cases of ordinary malignant malaria.

The size of some of these cell inclusions would preclude them, one would think, from passing through the ordinary bacterial filter candle, but a granular phase, if such exists, would overcome this difficulty. Certainly the work of Prowazek and Aragao on smallpox at Rio de Janeiro, and the work of the former on the chlamydozoa generally, shows that the parasites of this group can pass through the ordinary bacterial filters. Probably the passage through takes place in the granular stage, and the retention of these granules by the ultra filter of the authors just mentioned, the filtrate then being no longer virulent would seem to supply the requisite proof that they are the real parasitic cause of the disease to which they belong.

As to whether blackwater fever, pellagra, and some of the undefined tropical fevers may ultimately be found to be due to parasites of the chlamydozoa, or similar groups as yet undescribed, time alone will show. Prowazek's discoveries have certainly stimulated work on those lines, and further researches into the etiology of diseases with filterable viruses, such as yellow fever, dengue, phlebotomus fever, &c., in the light of these new discoveries might well meet with success.

CASES OF FEVER PROBABLY DUE TO *BACILLUS ASIATICUS*.

By Aldo Castellani, M.D.

Director, Government Clinic for Tropical Diseases, Colombo.

In 1905, in a case of anchylostomyasis presenting a long protracted fever which did not cease after the patient got free of the parasite, I isolated from the stools and from the blood a peculiar bacillus which I named *Bacillus asiaticus*. I found the same bacillus later in a case of protracted fever in which anchylostoma and other worms were absent. More recently I have observed in two other cases of fever a closely allied organism to be presently described and which, for convenience sake, I will indicate with the term of *B. asiaticus* No. 2.

Case 1.—A Singhalese boy, aged 11, admitted to the clinic in June, 1905, with well marked signs of anchylostomyasis, general œdema, extreme pallor of the palpebral conjunctiva, &c. There was fever of the low intermittent type—the daily maximum reaching about 100° F. said to have been present for four months. The stools contained numerous ova of anchylostoma. Eucalyptus-chloroform treatment repeated three times cured the anchylostomyasis, but the fever continued of the same low intermittent type. From the stools *B. asiaticus* was isolated, and the same germ by means of the dilution method was also grown from the blood. Two months after the last anthelmintic treatment, considering that the fever was probably due to the germ isolated from the patient's blood, I prepared with that germ a vaccine and I injected the patient with it twice. The first time I only inoculated ½ c.c. of a twenty-four hours old broth culture heated for an hour to 55-60° F.; the temperature rose a little, but the course of the fever was not influenced. The second time, a week later, I injected 1½ c.c. of the vaccine prepared in the same manner; three hours after inoculation the temperature rose to 105° F., the patient becoming very sick. The day after, the fever stopped completely and did not recur. Whether the dropping of the fever was really due to the vaccine injection cannot be said with certainty, but there is a strong probability of this being so. The blood of this boy strongly agglutinated (1 to 300) *B. asiaticus* six months after the fever stopped; a year later no agglutination was present.

CASE 2.—Thobias, a Singhalese man, aged 28, kitchen coolie of the clinic, had low quotidian fever, at times subcontinuous, at times intermittent, for nine weeks. Repeated examination for malaria, Malta fever, typhoid, paratyphoid negative. Tubercular reactions (ophthalmic and cuti-reaction) negative. The blood agglutinated 1 in 80 *B. asiaticus* No. 1. The examination of the stools remained negative twice, but the third time two colonies of *B. asiaticus* were isolated. Attempts at growing the germ from the blood, repeated four times, always failed. The agglutinins for *B. asiaticus* disappeared four months after the fever ceased.

CASES OF FEVER IN WHICH B. ASIATICUS No. 2 WAS FOUND.

CASE 3.—Fernando, Singhalese, a medical student. Admitted to the Seamen's ward, General Hospital, in June, 1910, with fever said to have begun a month previously. Nothing worth noting in his past medical history. The course of the fever is shown in the temperature chart No. 1. The temperature never rose very high; no shivering fits, no sweatings. The general condition of the patient was never very serious; his mind always clear. He complained, especially during the latter course of the disease, of severe abdominal pains, principally along the descending colon and sigmoid. There was constipation followed by slight diarrhœa; no blood or mucus in the stools; numerous eggs of *Ascaris lumbricoides* present. After a santonin treatment he passed several ascaridæ and the eggs disappeared from the stools, but the pains persisted. The patient left the hospital still having fever which lasted another month, four months in all. In this case Widal's reaction repeated ten times was negative. Serum reaction for Paratyphoid A and B and Malta fever negative. Examination of the blood for the *B. typhosus* using the bile media and the dilution method negative. In the stools examined six times the *B. typhosus* and *B. paratyphosus* A and B were absent; colonies of *B. asiaticus* No. 2 were present twice. The blood agglutinated *B. asiaticus* No. 2 in a dilution of 1 in 80, and occasionally 1 in 200; did not agglutinate *B. asiaticus* No. 1, nor, as I have already mentioned *B. typhosus*, *B. paratyphosus* A and *Micrococcus melitensis*, and none of the bacilli of the dysentery group. The agglutination of *B. asiaticus* No. 2 persisted in the same strength for two months after the fever was over; then the amount of agglutination gradually decreased until seven months after the termination of the fever no agglutination was present even in a dilution of 1 in 10.

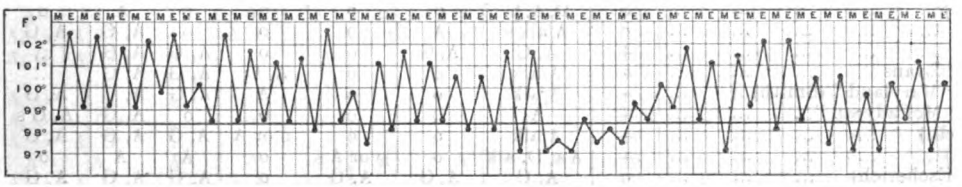

CHART 1.—PORTION OF TEMPERATURE CHART OF CASE 3.

CASE 4.—Dr. G., European, aged 30. The illness began with slight fever and slight lassitude, about the middle of May, 1911; entered the General Hospital of Colombo on May 25, 1911. General condition fairly good, no headache, mind perfectly clear. The fever lasted three weeks, never very high.

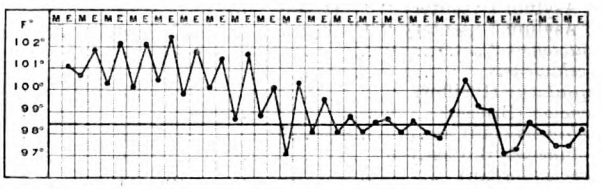

CHART 2.—PORTION OF TEMPERATURE CHART OF CASE 4.

The patient was never in a typhoid state, mind always clear, tongue not very coated, no roseola, no enlargement of the spleen. He complained during the last two weeks of severe abdominal pains, with some tenderness on pressure along the left epicolon and sigmoid regions, but never had any diarrhœa. Eggs of worms absent.

Bacteriological Examination of Blood.—Serum reaction for *B. typhosus*, *B. paratyphosus* A and B repeated three times during the disease, and once after the fever had stopped, negative. Examination of the blood (repeated twice) for the presence of the typhoid bacillus by means of bile media negative. Sero agglutination for Malta fever repeated twice negative; for bacilli of the dysentery group (Kruse-Shiga, Flexner) negative. Sero agglutination for *B. asiaticus* No. 2 positive 1 in 80; for *B. asiaticus* No. 1 negative above 1 in 10.

Stools (microscopical examination).—No protozoa, no eggs of worms; bacteriological examination for *B. typhosus*, *B. paratyphosus* A and B and dysentery bacilli constantly absent. Colonies of *B. asiaticus* No. 2 were isolated on one occasion.

Description of B. asiaticus No. 1.—Morphologically it is a short rod, 2-5 microns in length, closely resembling the bacilli of the dysentery group; non-motile; Brownian movement not very marked. *Culture characters—Broth:* Growth fairly abundant with general turbidity of the medium; during the first three days no pellicle is noticeable, later on, a pellicle is often present. *Peptone water:* General turbidity, no pellicle. *Agar:* Colonies whitish, roundish, typhoid-like; after a time coalesce together in a white mass. *Gelatine:* Typhoid-like, no liquefaction. *Serum:* Nothing characteristic. *Blood-serum:* Nothing characteristic.

TABLE SHOWING CULTURAL REACTIONS OF B. ASIATICUS AND OTHER AEROBIC

	Motility	Litmus Milk	Lactose	Saccharose	Dulcite	Mannite	Glucose	Maltose	Dextrin	Raffinose	Arabinose
B. asiaticus No. 1 (Cast.)	o	A/alk	o	A, G	o	A, G	A, G	A, G	A, G	A, G	A, G
B. asiaticus No. 2 (Cast.)	o	A/alk	o	A, G	o	A, G	A, G	A, G	A, G	A, G	A, G
B. acidi lactici (Hüppe)	o	A, C	A, G	o	o	A, G	A, G	A, G	A, G	A, G	A, G
B. aertrycke ("Van Ermengem")	+	A/alk	o	o	A, G	A, G	A, G	A, G	o	o	A, Gs
B. of Archibald	+	A/alk	o	o	A, G	A, G	A, G	A, G	...	o	...
B. of Asylum Dysentery "8" (Eyre)	o	o	o	o	o	o	A	o	o	o	As
B. of Asylum Dysentery "9" (Eyre)	o	A/alk s	o	o	o	o	A	As	As	o	o
B. bentotensis (Cast.)	+	A	A	A	As	o	A	A	o	As	o
B. breslaviensis	+	A/alk	o	o	A, G	A, G	A, G	...	...	...	...
B. capsulatus (Pfeiffer)	o	A, C	A, G	A, G	o	A, G	A, G	A, G	A, G	A, G	A, G
B. cavicida (Brieger)	+	A, C	A, G	o	A, G	A, G	A, G	...	A, G	A, G	A, G
B. ceylanensis A (Cast.)	o	A, C	o	o	o	o	A	o	o	o	o
B. ceylanensis B (Cast.)	o	A, C	A	A	A	A	A	A	A	A	A
B. cloacæ (Jordan)	+	A, C	A, G	A, G	o	A, G	A, G	A, G	A, G	A, G	A, G
B. coli anaërogenes (Lembke)	o	A, C	A	o	o	o	A	o	...	...	...
B. coli communis (Escherich)	+	A, C	A, G	o	A, G	A, G	A, G	A, G	A, G	A, G	A, G
B. coli mutabilis (Massini)	o	A, C	A, G	o	o	...	...	...	...	...	...
B. coli, like "Norman Hall"	+	A	As, Gs	o	A, G	A, G	A, Gs	A, G	...	o	...
B. coscoroba	o	A, C	A, G	A, G	o	A, G	A, G	...	A, G	A, Gs	A, G
B. dysenteriæ (Kruse-Shiga)	o	A/alk	o	o	o	o	A	As	As	o	o
B. dysenteriæ, "Flexner"	o	As/alk s	o	o	o	A	A	A	A	As	A
B. dysenteriæ, "Flexner" (Willmore Eltor)	o	As/alk s	o	o	o	A	A	o	As	As	A
B. dysenteriæ, "Y" (Hiss and Russell)	o	As/alk s	o	o	o	A	A	A	A	A	A
B. dysenteriæ, "Tor 22" (Willmore)	o	As/alk s	o	o	o	A	A	A	o	A	A
B. dysenteriæ, "Tor R.H.B." (Willmore)	o	A/alk	o	o	o	A	A	o	A	A	A
B. dysenteriæ, "Tor R.E.T." (Willmore)	o	As/alk s	o	o	o	A	A	o	o	As	A
B. entericus (Cast.)	o	o	A, G	o	A, G	A, G	A, G	A, G	A, Gs	o/D	A, G
B. enteritidis "Original A" (Gaertner)	+	A/alk	o	o	A, G	A, G	A, G	A, G	A, G	A, G	A, G
B. enteritidis B	o	A/alk	o	o	A, G	A, G	A, G	A, G	A, G	A, G	A, G
B. of epidemic jaundice	+	A/alk	o	o	o	A, G	A, G	A, G	?	A, G	A, G
B. fæcalis alkaligenes	+	Alk	o	o	o	A	A	A	A	A ±	o
B. gasoformans non-liquefaciens	o	A, C	A, G	A, G	o	...	...	...	...	...	...
B. gintotensis (Cast.)	o	D, A, C	o	o	o	o	A	o	o	o	A
B. giumai (Cast.)	o	A/alk s	A	o	o	o	A, G	A, G	A, Gs	o	A, G
B. grünthal	+	A, C	A, G	o	o	A, G	A, G	...	A, G	A, G	A, G
B. of hog cholera, "Evans"	+	A/alk	o	o	A, G	A, G	A, G	...	...	...	...
B. of hog cholera, "Maryland" (Smith)	+	A/alk	o	o	A	A, G	A, G	A, G	A, G	A	A
B. of hog cholera, "McFadyean"	+	A	o	o	o	o	A, G	A, Gs	A, Gs	o	A, G
B. icteroides (Sanarelli)	+	A/alk	o	o	o or A	A, G	A, G	A, G	A, G	A, G	A
B. kandiensis (Cast.)	+	As, D, alk	o	o or As	o	A	A	o	o	o	o
B. lactis aerogenes (Escherich)	o	A, C	A, G	A, G	o	A, G	A, G	A, G	A, G	A, G	A, G
B. levans (Wolffin)	+	A, C	A, G	o	o	A, G	A, G	...	A, G	A, G	A, G
B. lunavensis (Cast.)	o	As/alk s	o	A	o	o	A	A	A	o	A
B. madampensis (Cast.)	o	A, C	A	A	o	A	A	A	A	As	A
B. moorsele	+	A/alk	o	o	A, G	A, G	A, G	...	...	...	...
B. morgan No. 1	+	o/alk	o	o	o	o	A, Gs	o	o	o	o
B. morgan No. 3	o	A o	o	o	o	A	A	A	A	o	A
B. morgan No. 4	o	As alk s	o	o	o	A	A	o	o	As	A
B. mustelæ septicus	+	A, C	A, G	o	A, G	A, G	A, G	...	A, G	A, G	A, G
B. neapolitanus (Emmerich)	o	A, C	A, G	A, G	A, G	A, G	A, G	A, G	A, G	A, G	A, G
B. negombensis (Cast.)	+	o/alk	o	o	o	o	A	o	o	o	o
B. oxytocus perniciosus (Wyssokowitsch)	o	A, C	A, G	A G	A, G	A, G	A, G	...	A, G	A, G	A, G
B. para colon, "Le Sage"	...	...	o	o	A, G	A, G	A, G	A, G	...	...	A, G
B. para colon, "Mair"	+	A, C	A	o	o	A, G	A	...	...	...	...
B. para colon, "Day"	+	A/alk	o	o	A	A, G	A, G	A, G	A, G	A, G	A, G
B. para entericus (Cast.)	+	A	A, G	A, G	A, G	A, G	A, G	A, G	A, Gs	A, G	A, G
B. paratyphosus A (Schottmüller)	+	A	o	o	A, G	A, G	A, G	A, G	A, G	A, G	A, G
B. paratyphosus B (Schottmüller)	+	A/alk	o	o	A, G	A, G	A, G	A, G	A, G	A, G	A, G
B. pseudo-asiaticus (Cast.)	o	A/alk	o	A, G	A, Gs	A, G	A, G	A, G	A, G	A, G	A, G
B. pseudo coli (Cast.)	+	A, C	A, G	A, G	A, G	A, G	A, G	A, G	A, Gs	A, G	A, G
B. pseudo-dysenteriæ A (Kruse)	o	A	o	o	o	A	A	o	o	A	A
B. pseudo-dysenteriæ D 1 (Kruse)	o	As/alk s	o	o	o	A	A	o	As	A	A
B. pseudo-dysenteriæ D 2 (Kruse)	o	As/alk	o	o	o	A	A	o	o	A	A
B. pneumoniæ (Friedländer)	o	A, C	A	A, G	A, G	A, G	A, G	A. G	A, G	A, G	A, G
B. psittacosis (Nocard)	+	A/alk	o	o	A, G	A, G	A, G	A, G	A, G	A, G	A, G
B. proteus vulgaris (Hauser)	+	A, C	o	A, G	o	o	A, G	A, G	...	...	...
B. pyogenus fœtidus (Passet)	+	A, C	A	A	A	A	A	A	A	A	A
B. schaefferi	o	A, C	A, G	o	A, G	...	...	...	...	...	...
B. suicholeræ	+	A/alk	o	o	A	A, G	A, G	A. G	A, G	A	A
B. suipestifer (Kruse)	+	A/alk	o	o	A, G	A G	A, G	A, G	o	o	A, Gs
B. talavensis (Cast.)	+	Alk, D	o	A	o	o	A	o	o	o	o
B. tangallensis (Cast.)	o	As/alk	o	A	A	A	A	A	A	A	A
B. typhosus (Eberth.)	+	A	o	o	o	A	A	A	A	As	o
B. vesiculosus	o	A, C	A, G	o	o	...	...	...	...	...	...
B. wesenberg	+	A	A	A, G	A	A	A, G	...	...	...	...
V. choleræ "Saigon"	+	A	As	A	o, D	As	A	A	A	o, D	o, D
V. proteus (Finkler Prior)	+	As, C	o	o	...	o	o	...	...	...	...
V. zeylanicus (Cast.)	+	o	o	o	o	o	o	o	o	o	o

Abbreviations used in the table:—A, acid; G, gas; C, clot; D, decolorized; Alk, alkaline; s, slight; A/alk, acid then alkaline; Gt, general production of indol, non-motile or non-liquefaction of gelatine or serum as the

INTESTINAL BACTERIA WITH NAMES ARRANGED IN ALPHABETICAL ORDER.

Adonite	Inulin	Sorbite	Galactose	Lævulose	Inosite	Salacin	Amygdalin	Isodulcite	Erythrite	Glycerine	Indole	Voges-Prosk	Redn. Nitrates	Neutral Red	Gram	Gelatine	Serum	Broth	Peptone Water
o	o	A, G	A, G	A, G	o	o	o	A, G	o	A, G	+ s	o	o	o	o	o	o	Gt	Gt
o	o	A, G	A, G	A, G	o	o	o	A, G	o	A, G	+ s	o	o	o	o	o	o	Gt	Gt
A, G	o	A, G	A, G	A, G	o	o	...	...	o	...	+	o	+	...	o	o	o	Gt	Gt
o	o	A, G	A, G	A, G	A, G	o	o	A, G	o	A	+ s	o	...	...	o	o	o	Gt	Gt
o	o	...	A, G	...	...	...	...	...	...	...	+	+	...	...	o	o	o	Gt	...
...	o	o	A s	A	...	o	o	...	o	...	o	...	...	o	o	o	o	Gt	Gt
...	o	o	A	A	...	o	c	...	o	...	o	...	...	o	o	o	o	Gt	Gt
o	o	o	A	A	A	A s	o	o	o	A	+	o	...	o	o	o	o	Gt	Gt
...	..	...	...	...	...	...	...	...	...	...	o	..	...	...	o	o	o	Gt	...
A, G	o	A, G	A, G	A, G	A, G	...	...	...	...	...	±	+	+	...	o	o	o	...	...
o	o	...	A, G	A, G	o	A	...	..	...	...	+	o	+	+	o	o	o	...	...
o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	Gt, P s	Gt
o	o	A	A	A	o	o	o	A	o	A	+	o	o	o	o	o	o	Gt. P	Gt
o	o	A, G	A, G	A, G	A or o	o	...	...	o	...	±	+	+	...	o	+	±	Gt	Gt
...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	o	o	o	Gt	...
o	o	A, G	A, G	A, G	o	A, G	o	A, G	o	A, G	+	o	+	+	o	o	o	Gt	Gt
o	o	...	...	...	...	...	...	...	.	...	o	...	...	...	o	o	...	...	...
A, G	o	...	A, G	A, G	...	A	...	...	...	...	o	o	...	o	o	o	o	Gt	...
o	o	A, G	A, G	A, G	o	o	...	...	o	...	+	o	+	...	o	o	o	...	...
o	o	o	A	A	o	o	o	o	o or A s	A v s	o	o	...	o	o	o	o	Gt	Gt
o	o	o	A	A	o	o	o	o	o	o	+	o	...	o	o	o	o	Gt	Gt
o	A	o	A	...	...	o	o	o	o	o	+	...	...	o	o	o	o	...	...
o	o	o	A	A	o	o	o	o	o	o	+	o	...	o	o	o	o	Gt	Gt
o	o	o	A	...	...	o	o	o	o	o	+	...	...	...	o	o	o	...	...
o	o	o	A	...	...	o	o	o	o	o	+	...	...	...	o	o	o	...	...
o	A	o	A	...	...	o	A s	o	o	o	+ +	...	..	...	o	o	o	...	...
o	o	A, G	A, G	A, G	...	...	...	...	...	...	+	o	...	...	o	o	o	Gt, P s	Gt
o	o	A, G	A, G	A, G	...	o	...	...	...	...	o	o	...	+	o	o	o	Gt	Gt
o	o	A, G	A, G	A, G	...	o	o	...	o	...	o	o	..	+	o	o	o	Gt	Gt
...	o	A	A, G	A, G	...	...	...	...	...	...	+	o	...	..	o	o	o	Gt, P	...
o	o	A	A	A	...	o	o	..	o	...	o	o	...	o	o	o	o	Gt	Gt
A, G	o	...	...	...	A	...	...	...	...	...	o	±	+	...	o	o	...	...	...
o	o	o	A	o	o	o	o	o	o	o	o	o	...	o	o	o	o	Gt, P	Gt, P s
o	o	A, G	A, G	A, G	o	A, G	o	A, G	o	A s	+	o	...	o	o	o	o	Gt	Gt
o	o	A, G	A, G	A, G	o	...	...	...	o	...	+	o	+	...	o	o	o	Gt	...
...	...	...	...	...	...	..	...	...	...	...	+ s	...	...	...	o	o	o	Gt	...
...	...	A, G	A, G	A, G	...	...	...	...	...	...	o	o	...	...	o	o	o	Gt	...
...	o	o	A, G	A, G s	...	o	o	...	o	...	+ s	...	...	...	o	o	o	Gt	...
...	o	A, G	A, G	A, G	...	...	...	...	...	...	+	o	...	...	o	o	o	Gt, P	...
A	o	o	A	A	A	o	o	A	A	A	o	o	...	o	o	o	o	Gt	Gt
A, G	o ±	A, G	A, G	A, G	A, G	A, G	...	...	...	...	o	+	...	...	o	o	o	Gt	...
o	A, G	A, G	A, G	A, G	o	A, G	...	..	o	...	o	+	...	...	o	+	...	...	...
o	o	o	A	A	o	o	o	o	o	A v s	+	o	...	o	o	o	o	Gt, P	Gt
o	o	A	A	A	o	o	o	A	o	A	+	o	...	o	o	o	o	Gt	Gt
...	...	...	...	...	...	...	...	...	...	...	o	...	...	...	o	o	o	Gt	...
o	o	o	A, G s	A, G s	o	o	o	o	o	o, D	+ +	o	..	+	o	o	o	Gt	Gt
...	o	A	A	A	...	o	o	...	o	...	+ +	...	...	...	...	...	...	...	...
...	o	o	A	A	...	o	o	...	o	...	o	...	...	...	...	...	...	...	...
o	o	A, G	A, G	A, G	...	...	...	...	...	...	+	o	...	...	o	o	o	...	...
o	o	A, G	A, G	A, G	o	A, G s	o	A, G s	o	A, G s	+	o	+	...	o	o	o	...	...
o	o	o	A	A s	o	o	o	o	o	o	o	o	...	+ s	o	o	o	Gt, P	Gt
A, G	A, G	A, G	A, G	A, G	A, G	A, G	o	A, G	o	A, G	+	+	+	...	o	...	...	...	...
..	o	A, G	A, G	...	...	...	...	...	...	...	...	o	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	o	o	o	Gt	Gt
...	...	A	A, G	A, G	...	...	...	...	...	...	+	o	...	...	o	o	o	Gt, P	Gt
o	o	A, G	A, G	A, G	...	...	...	...	...	...	+	o	...	...	o	o	o	Gt, P s	Gt
o	o	A, G	A, G	A, G	o	o	o	A, G	o	A s	+	o	..	+	o	o	o	Gt	Gt
o	o	A, G	A, G	A, G	A, G	o	o	A, G	o	o	+ s	o	...	+	o	o	o	Gt	Gt
o	o	A, G	A, G	A, G	o	A, G	o	A, G	o	A, G	+	o	o	o	o	o	o	Gt	Gt
o	o	A, G	A, G	A, G	o	A, G	o	A, G	o	A, G s	+	o	o	o	o	o	o	Gt, P s	Gt
o	o	o	A	...	...	A	o	o	o	o	+ +	...	...	o	o	o	o	...	...
o	o	o	A	...	...	A s	o	A	o	o	+ +	...	...	...	o	o	o	...	...
o	o	o	A	...	...	o	A s	o	o	o	+ +	...	...	...	o	o	o	...	...
A, G	o	A, G	A, G	A, G	A, G	A, G	...	...	o	...	o	o	+	...	o	o	...	...	...
o	o	A, G	A, G	A, G	...	o	...	...	...	...	o	o	...	...	o	o	o	Gt	...
...	...	o	A, G	...	...	...	...	...	...	...	+	...	...	...	±	+	+	Gt	Gt
...	...	...	A	A	...	...	...	...	...	...	+	o	...	...	...	o	o	Gt	Gt
o	o	...	...	...	o	...	...	...	...	...	+	o	+	...	o	o	...	...	...
...	...	A, G	A, G	A, G	...	...	...	...	...	...	...	o	...	...	o	o	...	...	...
o	o	A, G	A, G	A, G	A, G	o	o	A, G	o	A s	+ s	o	...	...	o	o	o	Gt	Gt
o	o	o	A	A	A	A	o	o	o	A	+	o	...	o	o	o	o	Gt	Gt
o	o	A	A	A	o	A	o	A	o	A	+	o	...	o	o	o	o	Gt	Gt
o	o	A	A	A	o	o	o	o	o	A s	o	o	..	o	o	o	o	Gt	Gt
o	o	...	...	...	o	...	...	...	...	...	+	o	+	..	o	o	...	...	...
...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	o	o	...	Gt	...
o	o	o	A	A s	o	o	o	o	o	o or A v s	+ +	o	+	o	o	o	+	Gt, P	Gt, P
...	...	...	...	...	...	...	...	...	...	...	±	...	...	...	o	+	+	Gt, P	Gt
o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	Gt, P s	Gt, P s

turbidity; P, pellicle; v s, very slight; o, negative result, viz. :—neither acid nor clot in milk, neither acid nor gas in sugar media, non-case may be; +, positive result; ±, sometimes positive, sometimes negative.

Action on various sugars.

Lactose litmus broth,	2 per cent.	...	No acidity, no gas
Saccharose	2 ,,	...	Acid and gas, medium slightly decolorized
Dulcite	1 ,,	...	No acidity, no gas
Mannite	2 ,,	...	Acid and gas
Glucose	2 ,,	...	Acid and gas
Maltose	2 ,,	...	Acid and gas, medium decolorized
Dextrin	1 ,,	...	Acid and gas, medium decolorized
Raffinose	1 ,,	...	Acid and gas, medium decolorized
Arabinose	1 ,,	...	Acid and gas
Adonite	1 ,,	...	No acid, no gas
Inulin	1 ,,	...	No acid, no gas
Sorbite	1 ,,	...	Acid and gas, medium decolorized
Galactose	1 ,,	...	Acid and gas
Lævulose	1 ,,	...	Acid and gas
Indol ...	... ...	...	Slight

Pathogenicity.—Intraperitoneal injection of 1 c.c. broth culture of a recently isolated strain kills guinea-pigs in twenty-four to thirty-six hours; subcutaneous injections of ordinary doses do not kill the animals and give rise to only slight symptoms.

B. asiaticus No. 2.—This strain is practically identical with *B. asiaticus* No 1. morphologically and culturally. Minor differences, but not constant, are found in litmus milk; and occasionally in dulcite. In milk—as is the case with *B. asiaticus* No. 1—there is no production of acidity nor clotting. In litmus milk *B. asiaticus* No. 2 decolorizes the medium within twenty-four hours, the blue colour completely disappearing; the medium then remains white for about a week and then slowly turns blue again. The medium is rendered strongly alkaline; it is to be noted that even during the period when the medium is white it gives a strong alkaline reaction. It is difficult to explain the bleaching of the litmus milk though the reaction of the milk is still strongly alkaline, as proved by placing a drop of the litmus milk culture on red litmus paper or using a solution of neutral red. This is the appearance observed using Ceylon cow's milk; if imported milk be used (milkmaid brand, sterilized) then *B. asiaticus* No. 1 and *B. asiaticus* No. 2 behave identically: they both produce acidity followed by permanent alkalinity; no decoloration is observed. Biologically *B. asiaticus* Nos. 1 and 2 are probably not completely identical, as the serum of patients in whom *B. asiaticus* No. 2 was isolated, agglutinated only partially or not at all *B. asiaticus* No. 1. Moreover, in hyperimmunized animals there is no complete cross-agglutination, but further researches are necessary on this subject, having recourse also to other biological tests such as the absorption method, &c.

Relation of the Organisms described to other Intestinal Bacteria.—The table (pp. 164-165) shows the principal differential characters of various intestinal bacteria and *B. asiaticus*.

Conclusions.

(1) In four cases of fever of obscure origin and in which all the investigations for the usual infections such as typhoid, paratyphoid, Malta fever, malaria, &c., remained negative, a bacterium was isolated, which appears to be different from any other intestinal bacterium.

(2) Of this bacillus two varieties have been isolated which, for convenience sake may be called *B. asiaticus* No. 1 and *B. asiaticus* No. 2. The first was found in two cases of long protracted, rather low, intermittent and remittent fever; one of which harboured numerous anchylostomata. *B. asiaticus* No. 2 was isolated from two cases which were at first considered to be cases of typhoid, though the patients did not show any symptoms of enteric, there being no roseola, no enlargement of the spleen and the Widal and all bacteriological investigations for typhoid and paratyphoid remaining completely negative. In one of these two cases there was a heavy ascaris infection, but the fever continued after the worms were got rid of. In both cases a symptom is worth mentioning, viz., the rather severe abdominal pains, lasting in one case during the whole course of the disease, in the other being present during the later part of the malady and convalescence.

(3) It would seem to me probable that *B. asiaticus* No. 1 and *B. asiaticus* No. 2 were the causative agents of these cases of fever, for the following reasons:—(*a*) Presence of specific agglutinins in the patient's blood during the malady; agglutination slowly decreasing after the fever was over. (*b*) The blood of the patients did not agglutinate any other micro-organisms, nor were other pathogenic germs isolated. (*c*) I have never observed *B. asiaticus* Nos. 1 and 2 in the fæces of normal individuals, though, of course, it is probable that further experience will show that there exist carriers of this bacillus in analogy to what takes place with so many other pathogenic bacteria.

I wish to express my thanks to Mr. E. Burgess for the valuable assistance he has rendered me during the investigation.

A SEVERE CASE OF HOOKWORM INFECTION SHOWING AN ENTIRE ABSENCE OF EOSINOPHILIA.*

By L. J. Coppedge, M.D.

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The following case was observed while the writer was taking a three months' course at New Orleans School of Tropical Medicine, and is here presented on account of the interesting entire absence of eosinophiles from the peripheral blood, as shown by careful differential counts.

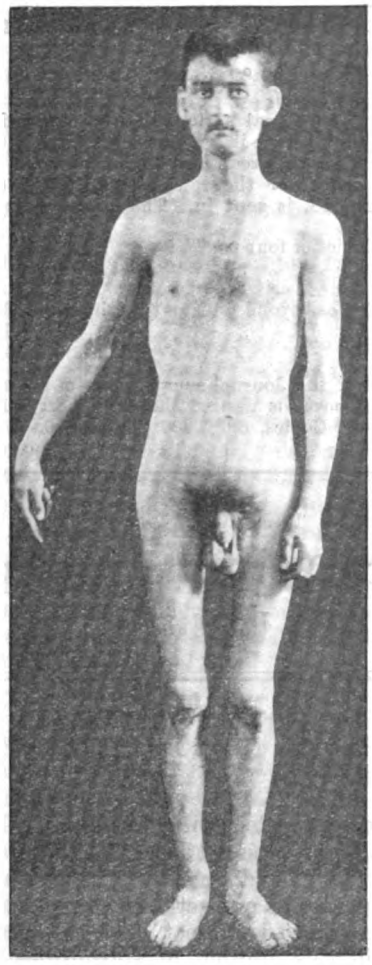
Patient.—W. S. M.; white; aged 23; married five years; occupation, farmer.

Family History.—Father alive and well, aged 53; mother died of typhoid, aged 45; five brothers and three sisters alive and well. All have had ground

* Studies from the Laboratory of Tropical Medicine and Hygiene, under the Direction of Creighton Wellman, Medical Department, Tulane University of Louisiana—No. 11.

itch. Two brothers and two sisters dead, cause unknown.

Personal History.—Patient has had several attacks of malaria, but none during recent years. Has had most of the infectious diseases of childhood. Remembers having had ground itch about two years ago. On his home premises there is no privy, always goes to a thicket to defæcate. Remembers going out barefoot in the early morning at the time of last attack of ground itch. Washed feet and put on shoes within half an hour, nevertheless ground itch followed. Has never gone barefoot habitually since early boyhood. Has been declining rapidly for about eight months. Has always lived in Vernon Parish, Louisiana, where the soil is light and sandy, and highly favourable to the development of ova of hookworm. Drinking water comes from a protected well, 55 ft. deep. Patient formerly weighed from 150 to 170 lb. and was strong and active. As a child in school he stood well with his fellows.



PHOTOGRAPH OF PATIENT SHOWING THE EMACIATED AND WASTED APPEARANCE.

Present Condition.—Height 5 ft. 11 in. Weight 131 lb. Skin pale, waxy and dry. No pink flush follows pinching of cheeks. Conjunctivæ chalky white, mucous surfaces of mouth, tongue and cheeks pale, gums a very light pink. Temperature record normal or subnormal, sometimes 97° F. Patient repeats questions aimlessly, and shows decided infantilism in forced conversation. Slight dry cough present. Apices of lungs normal, a few râles present; heart normal, but pronounced hæmic murmur present. Appetite good, no diarrhœa or constipation. Patient wasted and emaciated, facial aspect apathetic and tired. Complains of mental languor and loss of memory, also of dizziness, and shortness of breath on exertion. Liver normal, spleen slightly enlarged, patellar reflex normal.

Laboratory Examination.—Urine large in amount, pale, specific gravity 1.004, no albumin or sugar, no casts.

Fæces.—Showed large numbers of the ova of *Necator americanus*.

Blood.—Red cells, 1,800,000; leucocytes, 3,407; hæmoglobin, 40 per cent. Marked poikilocytosis and anisocytosis.

DIFFERENTIAL COUNT.

Small mononuclears	11 per cent.
Large mononuclears	1 ,,
Neutrophiles (Polymorphonuclears) ..	70 ,,
Eosinophiles	Absent.
Transitionals	14 per cent.
Neutrophilic myelocytes	3 ,,
Basophiles	1 ,,
Normoblasts, two observed	

The case here presented is in many respects typical of hookworm infection, especially as to history, habits of the patient, and his previous lack of sanitary conveniences, which is so common among the poorer classes of white people living in the Southern United States. The absence of eosinophilia, however, is most unusual.

In a study of 693 cases, Bass and Dock state that the average eosinophilia was $4\frac{1}{8}$ per cent., the highest 34 per cent. and the lowest 1.5 per cent.

In one hundred severe infections carefully studied by Ashford and Guiterrez, they state that a high degree of eosinophilia was almost constant, and that a low eosinophile count augured a bad prognosis, all their cases ending fatally which were attended by a paucity of eosinophiles. There was one exception to this, however.

Gomez in a study of twenty-six cases found eosinophilia ranging from $\frac{1}{3}$ to 21.9 per cent. Twenty of these cases averaged 5 per cent.

Chamberlain in sixty-four cases found the lowest eosinophile count 1 per cent., highest 26 per cent., average $8\frac{1}{2}$ per cent.

It may be said in this connection, that eight days after a treatment with thymol and purgatives, followed by the expulsion of 200 hookworms, a new blood count of the patient under discussion showed one eosinophile in several slides.

In conclusion the writer acknowledges with gratitude the kindness of Professor John B. Elliott, junr., in whose service the case occurred; of Dr. Pothier, Pathologist of the Charity Hospital, who kindly had the accompanying photograph made; of Mr. Jas. D. Garrett, interne of the ward in which the case occurred,

and who kindly furnished the results of his initial examination of the patient; and of Professor Creighton Wellman, at whose suggestion this paper was prepared, and who gave valuable suggestions and criticisms during its preparation.

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An Improved Carbolfuchsin.—In the *Journal of the American Medical Association*, May, 1912, Verhoeff, of Boston, proposes a new technique for the preparation of carbolfuchsin solution. As he states, the usual method of preparing carbolfuchsin for staining tubercle bacilli is to add a saturated alcoholic solution of fuchsin to a 5 per cent. aqueous solution of phenol (carbolic acid). Owing to a chemical reaction which takes place between water and phenol, a fine precipitate is gradually formed and the staining power of the solution becomes progressively impaired. For the best results, therefore, the solution should be freshly made, a fact that does not seem to be generally recognized. The following method of preparation Verhoeff has found superior to the usual one, in that only a single stock solution is required which is permanent, uniform in its action, and, when once prepared, never afterward requires to be filtered. From this stock solution an active staining solution may be immediately prepared by the simple addition of distilled water.

The stock solution is as follows:—

Phenol crystals, melted	25 c.c.
Absolute alcohol	50 c.c.
Fuchsin (basic)	2 grm.

Allow to remain over night in an incubator or on a steam radiator to ensure complete solution, cool and filter.

For use, add two drops of this stock solution to eight drops of distilled water. For films of sputum, &c., the dilution may conveniently be made on the slide or cover-slip. When larger quantities of staining solution are required, the dilution is made in the proportion of 1 c.c. of the stock solution to 6 c.c. of distilled water.

The same method will be found advantageous in preparing other stains containing phenol, notably carbolthionin. The latter makes a beautiful and rapid contrast stain for films stained for tubercle bacilli with carbolfuchsin.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JUNE 1, 1912.

WHERE TO ADVISE RESIDENTS IN THE TROPICS TO GO TO WHEN THEY COME HOME.

THIS constantly recurring question is one that, perhaps, will never be settled. The ideal place has yet to be found, and, moreover, what theoretically is an ideal place has not yet been even sketched.

We have received a great deal of very useful information in this Journal by setting out a category of questions, and I believe on this point, one surely of the highest practical importance, we could learn much from each other, to the great benefit of the public.

For Western Europeans coming home from the Tropics, the spring is well-nigh invariably the time chosen; unless, in fact, some acute illness necessitates a hurried removal, everyone comes home then, in order to avoid their own hot season, and to spend their holiday when the weather in Western Europe is at its best—namely, the spring and summer.

We must confine our attention to British folk leaving warm or tropical climates for Europe, otherwise the problem would assume proportions of too

wide dimensions. The matter has very frequently to be approached by the doctor at home from many points of view. There is the man who has just arrived in England with his wife and family, who comes to be overhauled and to be advised as to where he should settle. Then there is the man who has had "liver," occasional "touches of local fever," a "threatening of sprue," or "recurrences of diarrhœa, with mucus and some blood at times." In such phrases the man who is "off colour" describes his condition, and he will go "wherever you tell me, doctor." Then there is the invalid with a definite ailment; but his immediate future is generally at once determinable—mostly a nursing home.

The doctor in the Tropics is assailed by other problems. "Would you advise me to spend a month or so in the South of France, or elsewhere on the Mediterrean shores, before going home?" is a constantly recurring question, and if assent to that proposition is agreed to, "Where would you advise me to go to?" is the next. A doctor is supposed to have universal knowledge; he is expected to know every Spa; its season, its virtues, what the waters are appropriate for, how much to take, when to take them, &c. "Do you know a doctor there, and can you give me a letter to him?" "What is the best way of getting there, and what is the best hotel to put up at?" are a few of the items medical men have to advise upon. How a young man who, after finishing his medical training, goes out direct to the Tropics to practise can become acquainted with these details, or even the main features of different European Spas and Health Resorts, it is impossible to understand. We unfortunately have no lectures upon subjects of this kind in our medical schools, and even if we had the over-lectured medical student would not be likely to attend such lectures, for the subjects they deal with have no part in his examinations for degree or diploma. In many other ways the young medical man, when he goes into general practice at home, has to fend when asked for his opinion concerning dishes he never heard of, or wines that are unfamiliar to him. The "just qualified" young man who was engaged as a *locum tenens* in a West End practice, and who was asked by an old lady his opinion of "Sparkling Moselle," of which he had never heard, is an example of the inefficient manner in which young doctors are equipped in matters of diet, &c.

There are, however, certain principles which should be established as guides to doctors, both at home and abroad, in giving advice to those who are about to start for "home," and those who after arriving at home want to know where to go. Of course, much will depend upon the nature of the ailment, or if no definite ailment is present the general condition of the person seeking advice. Should a residence in the South of Europe be advised for persons leaving the Tropics in March before coming to Britain, with the idea that it is unwise to go direct to England, and be exposed to the changeable climate of April and early May? The question is, why is the tropical resident leaving the Tropics for more temperate climates? The answer must be to escape the sun and the heat and the depressing effects of a moist climate. It would seem, therefore, that the sooner the colder climate is reached the better, especially if the leave is short, say, four or six months. There is, however, a seemingly inborn dread of this in most people's minds; if left to themselves they will seek out a place where the climate is most akin to what they have been accustomed to; those coming direct to England, for instance, will go to the Channel Islands, to one of the resorts on the South Coast, or to Devon or Cornwall, unless otherwise advised, and frequently they journey thither and take a house there before the doctor at home sees them. What is the proper thing to do, is a question for the doctor to settle; and seeing that it is an overdose of heat and sun that is being escaped from, the treatment should apparently be residence in a cold climate so as to counteract the pernicious influence of the heat. The writer has never seen any good of a sojourn in the South of France before coming to England in the spring; he regards it as a waste of time to reside as a preliminary in a climate "as near as possible to that the invalid has come from"; but this may be a personal opinion altogether wrong, and the opinion of others who hold to the contrary would be welcomed.

Again, should the seaside be recommended as a place of residence, or should an inland low or high level be advised forthwith? Again, the writer would condemn the seaside for persons coming home from the Tropics, whether for the invalid, the semi-invalid, or the man coming home for a change merely. If there is anæmia go to high ground, if malaria is present avoid the sea level, if liver and intestinal troubles are in evidence, the writer regards the seaside as highly detrimental. This may again be a question of personal opinion, and the statements are made in the hope that these questions, vital questions really, may be discussed fully, and the writer's opinions either agreed with or opposed. The question of whether the winter and not the summer from the health point of view, as opposed to the most pleasant time to visit Britain, is not on therapeutic grounds the best time to come "home," is open also to discussion. The "fashion" recently instituted, of tropical residents going to the hills in Switzerland in January and February, is important from the hygienic point of view. The writer holds himself responsible for starting this fashion, and has had no cause to regret the advice given if the nature of the ailment is given due consideration. Shortly, it may be said that persons suffering from malaria, and especially when there is splenic enlargement, derive more benefit from a month's residence at an elevation of 4,000 ft. and over in the months of January and February than by any other course of treatment. But for persons suffering from intestinal ailments: sprue, post-dysenteric diarrhœa, chronic colitis, these same regions should be rigidly avoided. Appended are tables, which it is hoped will be filled by medical men resident abroad. Further remarks in the form of articles on this subject will be welcomed.

J. CANTLIE.

Abstracts.

A CRITICISM OF THE RESULTS OF ENGLISH WORKERS ON THE SO-CALLED HETEROGONY IN ANKYLOSTOMA.*

By Professor A. Looss.

SINCE the heterogony of the ankylostoma has no existence, those authors who think they have observed it must have been deceived. I shall now attempt to explain how their mistake has arisen, so far as this is possible from the articles published. Before entering into details, a simple illustration may serve to show the most important point, neglect of which led them into error.

Let us assume that some one has a passion for breeding fowls and has somewhere obtained a hen of a special breed, which after a short time lays six eggs. He watches carefully over her welfare and that of the eggs. A friend fond of practical jokes, however, slinks into the fowl-yard and, without being seen, exchanges two of the hen's eggs for duck's eggs of about the same age. Under exceptional circumstances, or if very suspicious, the owner of the eggs may perhaps discover the trick before the eggs are hatched; but it is more probable that he contents himself with daily inspections of the brooding hen and carefully protecting the hen-house from being entered by strangers. When, however, the eggs hatch and he sees the young birds, he cannot for a moment doubt that a trick has been played upon him. For he knows the animals and does not need to consult a text-book to ascertain that what he sees are four chickens and two ducklings. The difference between chickens and ducklings are theoretically and practically familiar to him and, since he knows them, strike him at once. He also knows from daily experience that a fowl does not lay duck's eggs, that a duckling is never hatched from a hen's egg, and that a duckling during its later life can never be transformed into a hen. On account of these well-known facts his conclusion is at once drawn; duck's eggs must in some way have been introduced among his hen's eggs. His conviction will in no way be influenced by the fact that he is at first quite unable to explain when or how the exchange took place; he will perhaps try to investigate this, but, even should his investigation altogether fail, should the very possibility of an exchange appear to be excluded, he will not for a moment make a mistake about the fact that an exchange must have been made, because the result of the hatching proved that the eggs had not all been hen's eggs.

If we now apply this comparison to our scientific case, we find that Leichtenstern and the other authors who thought they had observed the heterogony of *A. duodenale* acted in almost exactly the opposite way from the owner of the fowls. The latter relied, first and foremost, on what he saw objectively in the young birds; the authors who defend the heterogony of the ankylostoma relied, first and foremost, on what they knew subjectively about their cultures. Having, to the best of their ability, taken all precautions to prevent any admixture of foreign elements with the cultures, they felt convinced that the latter contained merely what they expected to find—viz., ankylostoma germs. Their conviction would at once have suffered a severe shock if they, like the owner of the fowls, had thoroughly known the organisms they had to do with. The ankylostoma larvæ, as a matter of fact, if known, can always be distinguished with certainty, by their internal organization, from all other forms that may occur with them in the same cultures. Had the authors, before drawing any conclusions, first paid attention to these characters, they would have found that the real ankylostoma larvæ outside a host at no time and under no conditions show a tendency to develop into a sexually mature generation. Whoever, on the other hand, does not know, or has not taken note of, the specific characters of the ankylostoma larvæ is without the most important criterion for a correct interpretation of his experiments. For, whether this will in the end be right or wrong depends alone on the accidental circumstance whether or not his cultures were pure in the beginning, and remained so during the whole time the experiment lasted.

It has already been mentioned that observers who have not had a special helminthological training, while examining parasites and their developmental forms, are often inclined to be content with using a low magnifying power. No doubt this old and insufficient method of examination plays a very important part in the confusion now under discussion. For, under low powers, the larvæ of many nematodes are actually so similar to one another as to be easily taken for the same species. A decision as to whether they really are the same species can only be arrived at by examining them under high powers. With these the distinctive characters of the ankylostoma larvæ and of any other forms which may be associated with them in cultures appear as clearly as do the distinctive characters of chickens and ducklings to the naked eye. The demand that the observer must know his organisms thus includes as a necessary preliminary condition the other demand that he should also be able to use the most suitable methods for recognizing them. The owner of the fowls could not be deceived because he knew his animals; the authors who thought they had observed the heterogony of *A. duodenale* were deceived, because they neither knew the animals they had to do with nor used the right means for recognizing them, relying instead on their culture methods. That they were unable to state how the pollution of the cultures came about, that the precautions taken even seemed to make such pollution impossible, is of as little consequence here, as it was in the case of the spurious hen's eggs.

To say how the pollution took place is more difficult, and, in many cases, quite impossible to-day. In my own practice, I have had only one similar experience which, however, is perhaps instructive enough to be here briefly described. I once started a culture of the

* Being an Abstract from the "Records of the School of Medicine," Cairo, vol. iv.

eggs of the *Ascaris* "*mystax*" in order to follow their development. They had been found unusually abundant in the fæces of a dog, and thus afforded a favourable object for study. In order to free the fæces from all coarser constituents, the dog was for some days fed entirely on milk and rice. Some of the fæces thus obtained were first thoroughly shaken up with water in a closed vessel so as to secure a homogeneous emulsion. The diluted fæces were then divided up into small portions in tall jars and mixed, in these, with a large amount of water. If such glasses are left standing for several hours, the eggs and the heavier fæcal particles gradually sink to the bottom, while the finer particles remain floating in the water and can be removed by pouring the latter off; the eggs becoming in this way to a certain extent cleansed. After several repetitions of this washing process, the sediments in the different jars were collected into a flat dish. The eggs were now contained in fairly clean water which, as it evaporated, was replaced by fresh water from the tap. Although the dish was kept covered with a glass plate, algæ, &c., found their way after a time into the culture; when the vegetable growth became too profuse the washing process above described was repeated. The eggs developed quite normally, the embryos matured and moved about more or less actively, according to the temperature, within the egg-shells, but did not hatch out. After about two and a half months, when examining the culture under the dissecting microscope, I, for the first time, discovered among the eggs a few free worms, which, for their size, might quite well have been hatched embryos. As there were as yet very few of them, I waited another week before making a more thorough examination. By this time the number of free worms had increased, but even with a magnifying glass it was no longer possible to mistake them for young ascarides, for no empty egg-shells were to be found, which must needs have been present had the free worms been hatched embryos. Examination with the microscope showed the worms to be actually free-living nematodes in all stages of development.

I am able, in this case, positively to assert that all things used in preparing the culture were clean, that only water direct from the tap was used, that the vessel was kept covered, &c. Further, it cannot be assumed that the germs which gave rise to the worms were already contained in the fæces of the dog; had this been the case, the nematodes would certainly have appeared sooner than two and a half months after the culture was started. But all this is no proof that they were connected with the ascaris eggs. Even if I had been positive that no one had touched the culture vessel during my absence, that it had all along been covered in such a way that neither dust nor flies nor anything of that sort could have access to the cultures, even then it would have been unjustifiable to connect the free rhabdites with the ascaris embryos; for a microscopic examination of the two would have shown that the anatomical structure of the ascaris embryos enclosed in the egg-shells was quite different from that of the free worms. However, to yield this result the examination should not have been restricted to the average size, the general external form and the general appearance of the internal organs, but ought to have included all those details that can be made out with a high power. In the neglect of this minute comparison lies the first and chief error of those authors who thought they had observed the heterogony of the ankylostoma.

I have said above that the ankylostoma larvæ can be practically recognized as such in every period of their life. I must add that this is not to be understood in the sense that even the species of the adult worm can always be told from its larvæ. As it was, for instance, not possible for me to distinguish the larval *A. duodenale* anatomically from those of *A. caninum*, so it is also very probable that the larvæ of the two genera *Necator* and *Uncinaria* and, generally, of all *Agchylostomidæ* will either not structurally differ at all, or else only in minute points, from the larvæ of *A. duodenale* and *A. caninum*. But there is no possibility, either, that these larvæ could have been the source of fallacy: for there is—for me at least—not the slightest doubt that their development resembles that of the true ankylostoma in all essential points and is, consequently, not complicated by heterogony. Only forms more remote from the ankylostomes are capable of becoming the cause of confusion, and from the young stages of such forms the ankylostoma larvæ can always be distinguished by certain anatomical characters. We shall become more closely acquainted with these distinctive features later on; all larvæ which do not show them are therefore ankylostoma larvæ, wherever they may occur.

What has thus far been said may be summarized in the following practical rules: If an investigator wishes to protect himself from errors—be he a beginner or a person of experience—he must attend first of all to the anatomical structure of the organisms he is working with. The eggs of the different species of parasites show, in the peculiarities of their shell and their contents, such points of difference that often even the species can be recognized, or, if not the species, at least the genus or the family to which the parent worms belong. The embryos developing in the eggs can, in most cases, be anatomically analysed through the egg-shell shortly before they are mature; by this analysis the observer is in a position to recognize them again when, after hatching, they occur free in the cultures. The simple growth of the young larvæ will hardly give rise to errors; if, however, as is usually the case, they change their shape and internal organization during development, then the different stages ought not to be considered as developmental phases of the same organism until, step by step, the changes from one to the other have been followed. That these changes chiefly occur at the time of moulting has already been explained: the animals should therefore be specially carefully observed during their moults. Forms, or stages, which differ, and which cannot in this way be traced beyond doubt to stages already known, do not belong to these stages, however difficult it may

seem to explain their presence in the cultures otherwise.

From these remarks, which to the experienced worker may appear trivial and superfluous, but which will perhaps be welcome to some younger investigator, I pass on to a short discussion of the works in which, since Leichtenstern, the heterogony of the ankylostoma has been asserted. A few years after Leichtenstern, but quite independently of him, Giles, in Assam, came to the same conclusion (1891). His statements as to the size, form and appearance of the eggs are quite correct, and so, as may at once be mentioned, are numerous other statements referring to particulars of the biology of the larvæ, *e.g.*, the fact that they develop badly if there is too much water in the culture medium, that they cannot withstand desiccation, that they pass through several moults, &c. The number of the latter could not be ascertained, but, in cases of favourable development, is estimated at no less than two per day, an estimate which, as we shall see, is decidedly too high. Giles further observed the hatching of the larvæ from the egg-shells but, owing to technical difficulties, was not able to follow the development of the individual larva more than a short way further. We here have the greatest and most vital gap in his observations. It is well known to most investigators that the task of closely following the development of an individual larva for a long time presents great practical difficulties and is often quite impossible. This disadvantage can, however, be entirely obviated by the anatomical analysis recommended above. This latter, in Giles's case, fell short of what was required. From describing the young larva, the author goes on at once to describe the male and female "rhabdites"; I shall extract from this description a few of the chief sentences which are of importance in judging of the results. On p. 74, Giles writes: "Almost up to the assumption of the adult rhabditis stage, the changes occurring at each change of skin are very gradual, and consist merely of growth of the parts that have already appeared, no further change taking place in the development of the generative organs until this great and final stage." On p. 75: "As far as can be made out, the commencement of the sexual differentiation of the male rhabdites takes place in the last ecdysis but one preceding that in which completely adult characters are assumed. . . . At this stage the generative gland consists of only one or two hyaline, multi-nucleate cells. The copulatory spicula, however, are well developed, and do not change to any extent during the remaining ecdyses. There is, however, no sign of the copulatory bursa, which appears after the next change of skin, the tail being very long and tapering so as to form a sort of flagellum. Even after the next ecdysis there is but little change in the generative gland. . . The caudal extremity is rather abruptly conical, and now shows a well-developed copulatory bursa. . ." On p. 78: "The copulatory bursa of the full-grown rhabdites, though agreeing in general form, differs a good deal in detail from that of the immature form found before the last change of skin." The development of the female in its general features is, according to Giles, similar to that of the male; it does not seem necessary to add the details. With regard to the fate of the descendants of this free generation the author says (p. 81): "The embryos hatched out from the eggs of the rhabdites are identical in size and appearance with those already described as hatched out from the eggs produced during the entozoic stage of the worm, and it is entirely a matter of chance whether they will develop into free organisms like their parents or become parasites like their grandparents." Some experiments were also made for the purpose of rearing this parasitic form (in *Macacus rhesus*) but, as the author says, "only partial success has been met with" (p. 81). I will not enter upon the details of these experiments here; some of them will be mentioned, later, in the discussion of the question as to how far the experiments can be regarded as proving their point.

Opposition was apparently at once raised to Giles's observations by Macdonald (1890). Unfortunately it has not been possible for me to obtain Macdonald's original article, and I can here refer only to what Sonsino says on the subject somewhat later (1893). That author publishes (in an Italian translation) a letter of Macdonald's, in which the latter writes: "Giles gives drawings of the males and the females of the sexually mature rhabditis which lead me to believe that he erroneously took the larvæ of *A. intestinalis* for those of *A. duodenale*. The *Anguillula* is common in Ceylon, and I have found that its larvæ develop within three days in our climate into sexually mature *A. stercoralis*. I am quite sure that the larvæ of *A. duodenale* never become sexually mature during free life, and I can, therefore, find no other explanation for Giles's discovery." (Macdonald according to Sonsino, 1893, Reprint, p. 13).

Sonsino himself joins in the doubts raised by Macdonald. Pointing out the contradictions which exist between the observations of Giles and the earlier observations of Perroncito and others, he suggests that Giles was deceived either by free-living nematodes (such as *R. terricola* and *R. pellio*) which had found their way into his cultures, or by a free-living generation of *R. intestinale*. He does not formally reject Giles's results, but thinks that they should be tested and that, should they be found erroneous, the way in which Giles was led into error should be pointed out.

During the sixty-eighth meeting of the British Medical Association in Ipswich, the Ankylostoma question, among others, was discussed. Giles (1900) there gave a *résumé* of the observations and conclusions he had already published in his report on kala-azar. Speaking of Sonsino's criticisms, he said "the first objection—viz., that the organisms described were *R. terricola* or other free nematodes—is obviously quite untenable in view of the method of examination adopted" (the subjective factor, pointed out above, here finds clear expression). "As to the second objection, viz., that the organisms were the free form of *Strongyloides stercoralis*, I can only say that the absence of *A. stercoralis*—that is, of the

embryos of *R. intestinale*—was carefully noted in the case of each specimen of the dejecta used for experiment; had the so-called *A. stercoralis* been present, it is inconceivable that it should have been overlooked in any examination that detected the presence of the ova of ankylostoma." In the further course of the discussion, Sir Patrick Manson remarked "that it is somewhat singular that *R. intestinale* was so seldom found by Giles in Assam, considering that it is so frequently associated elsewhere with the ankylostoma, and that the climate and other physical conditions closely resemble those of Cochin-China, where the parasite is extremely common, and where, indeed, it was first discovered by Normand" (Giles, 1900, p. 547). With regard to the description given by Giles of the life-history of the ankylostoma, Major Ronald Ross remarks "that he had carefully studied Major Giles's experiments on a rhabditiform stage, had partly followed them, and considered that they were sound. He thought that Sonsino's criticism of these experiments was unsound. Sonsino said that Giles had mistaken rhabdonema for ankylostoma; Major Ross supported Giles in stating that the former was uncommon in Assam—at least in Nowgong, and thought that such a mistake was too obvious a one to be easily made by a competent observer."

In a subsequent correction referring to the reports on this discussion, L. Rogers (1900) states that "the late Dr. Macdonald, in the report of the first Indian Medical Congress, states that he investigated the life-history of this worm both before and after Major Giles's work was published, and failed to confirm it, but, on the contrary, all his results agreed closely with those of Sonsino." To this I have only to add that Sonsino made no experiments of his own, but merely pointed out that Giles's results did not correspond with those of the older authors, and were, therefore, probably based on error.

Personal conviction of the individual observer, however strong it may be, must give way before objective facts. The fact emphasized by Manson, that the ankylostoma and *S. stercoralis* so often occur together is one which, since 1900, has been supported by a number of other observations. If, therefore, we remember the extraordinarily wide dispersal of ankylostoma in Assam, confirmed by Giles himself, and the similarity of climate, &c., mentioned by Manson, the absence, or even the infrequency, of *S. stercoralis* in Assam becomes extremely improbable.

Of the larvæ, Giles says: "If the worms be supplied with but a limited amount of their natural food, as happens in the method of cultivation in fæcalized sand, already described, they pass through all the stages already described, but only a single generation of mature rhabdites appears. After this the supply of nourishment is so far exhausted, that the progeny of those which have reached maturity fail to do the like and remain in the undifferentiated non-sexual stage. So far, however, from shortening their lives, this deprivation of a free supply of nourishment and the attendant arrest of development appears greatly to prolong it. As we have seen, with a free supply of nourishment the whole duration of life is a matter of only a few days; but if the development be arrested by exhaustion of the nutritive supply, the embryos remain without growing or changing in any way, for very long periods. What the limit of this may be, I am unable to say. I can only affirm that, after fully six months, my cultivations seem as rich in embryos as ever."

These observations are undoubtedly correct, but their interpretation is not correct. We have seen above that the rhabditiform larvæ of *Strongyloides*, discharged with the fæces, develop outside the host into one sexually mature generation; their descendants develop only to the stage of the filariform larva, in which they may remain alive for a long time; the non-parasitic part of their life history is therefore exactly that reported by Giles of the alleged rhabdites of the ankylostoma. It must further be remarked that, from the moment this stage is reached, the filariform larvæ require no more nourishment of any kind and actually take none. Thus, in spite of the seemingly contradictory results of some of Giles's experiments, it is not the presence or absence of food which causes the arrest of their development, but this arrest is a natural condition which could not have been altered by the most abundant supply of nutriment. Unlike *Strongyloides*, true free-living nematodes, so long as the supply of food lasted, would have multiplied in an unbroken sequence of generations; these latter cannot therefore have been present in those cases, where only one sexual generation was developed; of *A. duodenale* we know that no free-living generation at all is produced. Consequently, the observations by Giles quoted above as to the life history of the free stages all point, according to the present state of our knowledge, to *Strongyloides*.

Let us now pass on to the feeding experiments made by the author. In describing the results of the first of these, in which the animal was killed and examined "a few days" after being fed, he writes: "At first sight, the duodenum seemed destitute of parasites but, on placing pieces of the mucous membrane in a tray of water, under the simple microscope, countless multitudes of very small nematodes were seen adhering to the mucous membrane. They had attained, in some cases, nearly half the length of an adult *Dochmius duodenalis*, but were extremely slender, the generative organs being still quite indeterminate, and the whole organization of the parasite more like an overgrown, immature rhabditis than an entozoic *Dochmius*, only one or two being sufficiently developed to admit of the determination of sex, and these were females." In another experiment, the animal infected was killed three months after the administration of the parasites; in reporting the result, the author writes: "The animal was quite healthy, except that, just as in the previous case, numbers of nematodes were found adhering to the mucous membrane of the duodenum, though not of course in anything like the numbers that were found in the first experiment. They had increased a good deal in length, but were otherwise but little in advance of those found in the previous experiment. The sex of all specimens could, however, now be made out, and it is a very curious

circumstance that over thirty specimens which were examined microscopically were all females, and a careful search for small specimens entirely failed to bring to light a single male." From these quotations, which are enough for my purpose, no further doubt is possible, that the "small nematodes" found in such large numbers by Giles were *Strongyloides*, probably *S. stercoralis*. The small size and slender shape of the body in combination with the fact that all specimens were females, are significant enough in worms three months old.

I should like to add that, some years ago, I examined a number of monkeys which had been imported from India (*via* Suez) direct to Egypt; so far as I can remember, they all harboured, and some in large numbers, a species of *Strongyloides*, which was so like the *Strongyloides* found in human beings that I am inclined to consider it as that species. *S. stercoralis* also apparently occurs in various African monkeys, and thus seems widely distributed; it becomes therefore rather difficult to understand its absence only in Assam. I feel tempted, on the contrary, in consequence of Giles's researches, as I interpret them, to assert that *S. stercoralis* (or a closely allied species) must be particularly abundant in India and Assam both in man and in animals.

So much for the question as to how far *S. stercoralis* was concerned in the investigations which led Giles to think he had observed heterogony in the ankylostoma. Let us now pass on to the other question as to how far free living nematodes might have been concerned in the matter. In answer to Sonsino, the author explains that the "objection is obviously quite untenable in view of the method of examination adopted." With regard to this reply, I would first recall the example given above of the owner of the fowls. From that illustration we learnt that, as soon as the fact was established that the eggs had not all been hen's eggs, the question as to how they had become mixed with others was of little practical consequence. However problematical or actually impossible an exchange appeared to be, the proof that two different species of animals had emerged from apparently the same kind of eggs, made the fact of an exchange having taken place a certainty. An analogous fact can now without difficulty be proved from Giles's description of the alleged "rhabdites" of *A. duodenale*.

For this purpose I would refer to the statements reproduced above as to the "developmental stages of the male rhabdites," which are divided by moults. They are all, according to Giles, characterized by the presence of spicula; since these, in all known nematodes, only appear in the sexually mature stage, all the individuals that showed this character in Giles's cultures, must have been, sexually, fully developed organisms. The author's statements that in some of them the genital organs were only slightly developed, rests on an error in observation which, it may be said in passing, may very easily occur, owing to the opacity of the intestine and the great transparency of the testes. In all nematodes, the configuration of the caudal part of the body, *i.e.*, the form of the bursa, the number and arrangement of the bursal rays, the number and shape of the spicula and so on, afford very important and constant characters for distinguishing the different species; so much so, indeed, that in the classification of the nematodes, it is usual to regard forms differing in the shape of the bursa as independent species. From this point of view, therefore, the three alleged "developmental stages" of the ankylostoma are the fully developed males of three independent species. The same conclusion must be drawn by every unprejudiced observer from the figures given by Giles.

There cannot thus be the slightest doubt that at least three different, independent species were present in Giles's faecal cultures. Whether any one of these, or which of them, was the free living form of *S. stercoralis* can no longer be said with certainty. According to Giles, all the three forms are stages in the heterogony of *A. duodenale*; even if we concede that this interpretation is correct for one of them, the two others would undoubtedly represent admixtures of foreign elements with the cultures. This disproves Giles's argument that the culture method used was a sure protection against secondary pollution. If, further, the cultures were polluted by two forms which developed non-parasitic sexual stages, they might as well have been polluted by others, and this does away with the logical necessity of regarding any one of the three adult rhabditidæ observed by Giles as being developmental stages of the ankylostoma.

In reality, none of the sexually differentiated free-living forms belong to the life-cycle of *A. duodenale*. Giles's work contains a large number of good and quite correct observations; the fact that these led to wrong conclusions with regard to the life-history of the parasite is accounted for by too strong subjective confidence in the methods used and neglect of exact objective examination of the parasites themselves.

(To be continued.)

Notices.

THE TROPICAL DISEASES BUREAU.[1]

THE *British Medical Journal* stated a short time ago that the name of the Sleeping Sickness Bureau would probably soon be changed; this expectation is now about to be realized, and the Journal is officially informed that from July 1, the bureau will be known as the Tropical Diseases Bureau.

The new bureau will deal with all exotic diseases which are prevalent in tropical and subtropical regions, and will publish at frequent intervals a *Tropical Diseases Bulletin*, which will take the place of the present *Sleeping Sickness Bulletin*. The director will have the help of an assistant director and a number of experts, who will be responsible for

[1] From the *British Medical Journal*, May 18, 1912.

Where do you consider it best for persons to go when leaving the Tropics for their health or change?

I.—When suffering from Malaria.

	REMARKS.
1. *Do you consider the winter or summer the better time to come "home"?*	
2. *Do you advise a sojourn in South of Europe before coming to Britain?*	
3. *Do you consider residence, with winter sports, in Switzerland, beneficial or otherwise?*	
4. *Do you advise residence by the sea, inland or at a high level whilst in Britain?*	
5. *Do you advise continuance of quinine taking whilst in England if no malaria parasites are found in the blood?*	

II.—When suffering from Intestinal Ailments.

	REMARKS.
1. *When intestinal ailments (not acute) are present do you advise sojourn in the South of Europe before coming to Britain?*	
2. *Do you consider the sea-side, inland or high ground residence the best?*	
3. *What period of the year should persons with intestinal derangements come to Britain when the disease is not acute or symptoms pronounced?*	
4. *What do you consider the period of leave necessary for convalescence when a chronic affection of the bowel is gradually improving?*	

Name .....

Address .....

the different subjects, and will furnish authoritative reviews and summaries of published papers, to appear in the *Bulletin*. Thus, the results of the most recent researches on every tropical disease in every country, new methods of treatment, improved means of prevention, will quickly become available for the remote worker in the Tropics. The tropical diseases of animals will be treated in a separate publication. To represent veterinary science Sir John McFadyean and Mr. Stewart Stockman have joined the Committee, which includes among its members Sir P. Manson, Sir D. Bruce, Sir W. Leishman, and Sir J. Rose Bradford. Both the medical and the veterinary bulletins will be supplied free to medical and veterinary officers of India and the subscribing Colonies; to others they will be on sale.

It may be recalled that the Sleeping Sickness Bureau had its origin in the International Conference on Sleeping Sickness, held in London, under the Presidency of Lord Fitzmaurice, in June, 1907, and March, 1908, to concert measures for the control of that disease, which was spreading rapidly in tropical Africa. It was then proposed to have a central international bureau "to extract and circulate all new literature on sleeping sickness." This project fell through, because the delegates were not unanimous as to the seat of the bureau, or even the necessity for its separate existence. Arrangements were therefore made by Lord Elgin, then Colonial Secretary, for the establishment of a British Bureau, maintained by imperial funds, with a contribution from the Sudan Government. The Royal Society agreed to house the bureau, and was thus indirectly a third contributor. Lord Elgin appointed an Honorary Committee, with Sir J. West Ridgeway as Chairman, to manage the bureau, and the first meeting took place in April, 1908. The bureau initiated the dispatch of several expeditions to investigate sleeping sickness in tropical Africa, and has supplied information to many inquirers.

It was not long before it became evident that what the bureau was doing for sleeping sickness could and should be done in the same way for tropical diseases generally. Lord Crewe, when Colonial Secretary, and the present Colonial Secretary, Mr. Lewis Harcourt, have both interested themselves in the expansion of the bureau, and the increased expenditure entailed will be provided by the Treasury, the Indian Government (now represented on the Committee by Sir A. Branfoot), the Sudan Government, the Union of South Africa, Ceylon, the Federated Malay States, Southern Nigeria, the Gold Coast, Sierra Leone, the Gambia, Fiji, Trinidad and Jamaica; the annual available sum is approximately £3,000. The Bureau, having outgrown the accommodation generously provided by the Royal Society, will have its quarters at the Imperial Institute.

The Sleeping Sickness Bureau has already issued thirty-six numbers of its *Bulletin*, each containing an account of current work in the field and laboratory on sleeping sickness and other trypanosome diseases, maps of distribution of sleeping sickness and tse-tse flies, an exhaustive bibliography, a popular pamphlet on the means of prevention of sleeping sickness, and more recently *Bulletins* on kala-azar. The circulation of the monthly *Sleeping Sickness Bulletin* is 1,100 copies, of which about half go to Africa. The present library, in which current files of all the journals of tropical medicine are to be found, forms the nucleus of a good tropical diseases library. It is expected to grow rapidly, and to become of great value to medical officers home on leave from the Tropics.

A NEW REVIEW OF BACTERIOLOGY.

DRS. FOULERTON AND SLATER propose to start a new Review of Bacteriology, Protozoology and General Parasitology. The Review will appear five or six times a year. The inclusive subscription is 10s. 6d. per annum, payable in advance and single copies will not be sold. The publishing offices will be at 36-38, Whitefriars Street, E.C., and all editorial communications should be addressed to A. G. R. Foulerton, F.R.C.S., Bacteriological and Public Health Department, the Middlesex Hospital, London, W.

A NEW SCHOLARSHIP FOR THE LONDON SCHOOL OF TROPICAL MEDICINE.

SIR WILLIAM BENNETT, K.C.V.O., has placed at the disposal of the London School of Tropical Medicine the sum of £10,000 bequeathed to him by the late Lord Wandsworth for the purpose of medical research.

The gift is made with certain conditions which include the establishment of a Scholarship tenable for two or three years, preference being given to a British subject.

The Committee of Management of the Seamen's Hospital Society are the Trustees of the Fund, and the scholar will be appointed by that body on the recommendation of the Committee of the London School of Tropical Medicine.

This munificent benefaction will enable the School to extend its usefulness. In the past much service has been rendered by Lord Sheffield and Sir John Craggs in making it possible for the School to send some of its students on expeditions which have resulted in important discoveries.

The past work includes the demonstration of the manner in which the *Filaria bancrofti*, the cause of elephantiasis, passes from the mosquito into man, the mode in which the lymphatics become blocked by this worm, and various additions to our knowledge of malaria, trypanosomiasis, kala-azar, Delhi boil, leprosy, dysentery, &c.

It is probable that the first Wandsworth Scholar will make the human blood-worms his main study, and will proceed to the West Coast of Africa for this purpose.

Notes and News.

YELLOW FEVER IN CHILE.—The *New York Medical Journal*, May 11, 1912, reports that an outbreak of yellow fever has occurred in Tocopila, Chile, and as a result the port has been closed. Forty cases of the disease have been reported, with seven deaths.

ENTOMOLOGY. — The *Bulletin of Entomological Research* for May, 1912 (vol. iii, Part I., pp. 1-112), contains the following papers on entomological subjects :—

"A New Species of Stygeromyia from the East African Protectorate" and "Notes on African Blood-Sucking Midges," by Mr. E. E. Austen; "A New West African Springtail," by Professor Carpenter; "A Synopsis of the Species of African Culicidæ other than Anopheles," by F. W. Edwards; "Notes on the Mosquitoes observed at Bole, Northern Territories, Gold Coast," by Dr. A. Ingram; "Observations on the occurrence of Glossina in the Mongalla Province of the Anglo-Egyptian Sudan," by Harold H. King; "Notes on *Glossina morsitans* in Northern Rhodesia," by Mr. Lloyd; "Notes on the Occurrence and Habits of *G. fuscipes* in Uganda," by Dr. McConnell; "Experiments and Observations upon *G. palpalis*," by Dr. Macfie; "The Transmission of Pathogenic Micro-organism by Flies in St. Lucia," by Dr. Nicholls.

Drugs and Appliances.

PEAT PRODUCTS (SPHAGNOL) LIMITED, 18 and 19, Queenhithe, Upper Thames Street, E.C., produce some useful preparations of soap and ointment. These are very effective in skin diseases such as eczema and psoriasis. The active principles of Sphagnol consist chiefly of creasote and sulphur, the Sphagnol being a distillation of peat, the product being an oil which seems to act in skin diseases in much the same way as ichthyol. Suppositories made of Sphagnol have also been employed and many of their users have testified to their efficacy. Others have stated that the ointment has had very marked results in obstinate cases of psoriasis.

In addition to these purely medical preparations a toilet soap, shaving soap, and an emollient toilet cream are also on the market, and all of these will be found satisfactory and pleasant to use.

ECSOLENT COMPOUNDS.—These preparations will be found of use in the treatment of skin diseases. Ecsolent Dusting Powder, for example, is an antiseptic and absorbent toilet powder, while Ecsolent Soap is a superfatted antiseptic soap which is soothing and emollient, being useful therefore, in eczema and other irritative lesions of the skin. In addition to these there is another preparation (Ecsolent Compound) which also does good in dermatological infections.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

The British Guiana Medical Annual for 1910.

The above number of the *British Guiana Medical Annual* contains the following interesting papers: "Remarks on Sixty-four Cases of Enteric Fever treated in the Public Hospital, Georgetown, from December, 1908, to June, 1910," by E. D. Rowland, M.B.Edin.; "Practice of Midwifery at the Public Hospital, Georgetown," by A. J. Craigen, M.B., B.Ch. (Aberdeen); "Village Sanitation in British Guiana," by A. T. Ozzard, M.R.C.S., L.R.C.P.; "On the Incidence of Ankylostomiasis amongst the Police," by G. E. Carto, L.R.C.P. and S.; "The Nastin Treatment of Leprosy in British Guiana," by K. S. Wise, M.B., B.Sc. Lond., D.P.H., M.R.C.S., L.R.C.P.; "Three Cases of Anthrax Infection in Man, from the Public Hospital, Georgetown," by E. P. Minett, M.D.Brux., D.P.H. Camb., D.T.M. and H.Camb., M.R.C.S., L.R.C.P.; "*Culex mimeticus*," by K. S. Wise, M.B., B.S., B.Sc. Lond., D.P.H.; "Report on Second International Scientific Conference on Leprosy," by the Hon. J. E. Godfrey, M.B., C.M. (Surgeon-General, British Guiana); Part II—"Clinical Notes," by Drs. Q. B. de Freitas, Robertson and Mitchell; Part III—Transactions of the British Guiana Branch of the British Medical Association for 1909 and 1910; Part IV—The Public Health, Statistics and Medical Distribution of the Colony. (Extracted mainly from the Surgeon-General's and other Medical Reports.)

"Sleeping Sickness Bulletin," No. 37, 1912, vol iv.

The above number of the Sleeping Sickness Bulletin contains the following papers: "Report of the Luangwa Sleeping Sickness Commission"; "Wild Animals in Relation to Sleeping Sickness"; "*Trypanosoma rhodesiense*"; "Transmission"; "A Case of Sleeping Sickness, Treatment"; "Erythro-phagocytosis in Trypanosome Infections"; "*Trypanosoma grayi* and other Papers"; Sleeping Sickness News; Monthly List of References.

"The Journal of Experimental Medicine," vol xv, No. 4. April 1, 1912.

Trypanosoma hippicum.—Darling states that he has experimentally infected mules with *T. hippicum* by means of *Musca domestica*. He let the flies suck up blood that had been drawn from a heavily infected guinea pig and then immediately transferred them to the recently shaved scratched skin of a mule. Infection appeared to follow.

Darling also states in a second paper that he had infected mules with the same trypanosome (*T. hippicum*) by introducing trypanosomal blood into the cavities of the mouth and nose, that is through the mucous membranes.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

THE METEOROLOGY OF MALARIA.

By MATHEW D. O'CONNELL, M.D.

IN the JOURNAL OF TROPICAL MEDICINE of February 15, 1912, I gave, as accurately as the records at my disposal enabled me to do, the meteorological conditions under which malarial fever becomes most prevalent at Lahore, and found that the atmosphere was such as must of itself raise the body temperature of a large number of those immersed in it.

I propose further to give, as opportunity offers, the meteorological conditions under which the disease becomes prevalent elsewhere, and will begin with Singapore in the Straits Settlements. I find the following telegram in *The Times* of May 16, 1911:—

"MALARIA IN SINGAPORE,
"HIGH DEATH-RATE.
"*Singapore, May* 15.

"There is an extraordinary amount of malarial fever in Singapore just now. The death-rate for the week ending May 6 was 85.98 per thousand, nearly one-third of the deaths being due to malaria. There has been nothing exceptional in the season to account for the outbreak."

On looking up the meteorological details for the week ending May 6, 1911, at Singapore, I find the following in the *Singapore Free Press*, and from these it is apparent that the atmosphere there at the time malaria was so prevalent was such as must also, of itself, raise the body temperature of a large number of those immersed in it. The details are as follows:—

SINGAPORE, 1911.

	Temperature of Air, F.		Wind
	Dry bulb	Wet bulb	
May 4, 9 o'c., a.m. ...	86.8° ...	80.0° ...	S.E.
,, 3 ,, p.m. ...	86.4 ...	78.0 ...	S.E.
,, 9 ,, ,, ...	80.8 ...	77.0 ...	Calm
Maximum temperature of the day ...			90.0° F.
Minimum ,, ,, ...			76.5° F.
Rain			0

Although the hours at which these observations were made are not those at which the maximum and minimum were recorded, the details given for 3 o'clock and 9 o'clock p.m. enable us to estimate the atmospheric conditions, not only between 3 o'clock and 9 o'clock p.m., but practically throughout the whole night, remembering that the maximum atmospheric temperature is usually attained between 1 o'clock p.m. and 3 o'clock p.m., and the minimum about sunrise. Of course, only hourly observations would be absolutely accurate, but failing these the calculated temperatures afford an indication of the atmospheric conditions.

From the actual observations at Singapore above given, it is seen that:—

(1) The dry bulb temperature of the air fell from 86.4° F. at 3 o'clock p.m. to 80.8° F. at 9 o'clock p.m., or at the rate of 0.9333° per hour.

(2) The wet bulb temperature fell from 78.0° F. at 3 o'clock p.m. to 77.0° at 9 o'clock, or at the rate of 0.1666 per hour.

(3) The wind fell from a rate at which its direction (S.E.), and therefore its velocity, was registrable, to a rate (calm) at which its velocity was not registrable.

From the above can be constructed a table giving the hourly meteorological conditions between 3 o'clock p.m. and 9 o'clock p.m., as follows:—

SINGAPORE, MAY 4, 1911.

1911	Temperature of Air, F.		Wind
	Dry	Wet	
May 4, 3 o'c., p.m. ...	86.4° ...	78.0° ...	S.E.
,, 4 ,, ...	85.4 ...	77.8	
,, 5 ,, ...	84.5 ...	77.6	
,, 6 ,, ...	83.6 ...	77.5	
,, 7 ,, ...	82.6 ..	77.3	
,, 8 ,, ...	81.7 ...	77.1	
,, 9 ,, ...	80.8 ...	77.0 ..	Calm

As the minimum dry bulb temperature, 76.5°, would be reached about 6 o'clock a.m., the fall of dry bulb temperature would be only about 0.4777° per hour, but as the wet bulb minimum is not recorded the continuation of the table for the night hours is not possible.

I find the following meteorological details for May 3, 1911, in the *Singapore Free Press* also:—

1911	Temperature of Air, F.		Wind
	Dry	Wet	
May 3, 9 o'c., a.m. ...	86.8° ...	78.8° ...	S.E.
,, 3 ,, p.m. ...	90.0 ...	77.5 ...	S.E.
,, 9 ,, ,, ...	82.5 ...	77.0 ..	Calm
Maximum temperature of day ...			91.5° F.
Minimum ,, ,, ...			76.4° F.
Rain	Slight drizzle at 8 o'c., a.m.		

From the above we get the following atmospheric conditions at Singapore from 3 o'clock p.m. to 9 o'clock p.m. on May 30, 1911, in the same way as previously for May 4:—

1911	Temperature of Air, F.		Wind
	Dry	Wet	
May 3, 3 o'c., p.m. ...	90.0° ...	77.5° ...	S.E.
,, 4 ,, ...	88.7 ...	77.4	
,, 5 ,, ...	87.5 ...	77.3	
,, 6 ,, ...	86.2 ...	77.2	
,, 7 ,, ...	85.0 ...	77.1	
,, 8 ,, ...	83.7 ...	77.08	
,, 9 ,, ...	82.5 ...	77.0 ...	Calm

Again, I find the following record for May 1, 1911, in the *Singapore Free Press*:—

	Temperature of Air, F.		Wind
	Dry	Wet	
May 1, 9 o'c., a.m. ...	89.5° ...	80.0° ...	S.E.
,, 3 ,, p.m. ...	88.8 ...	79.9 ...	S.E.
,, 9 ,, ,, ...	84.0 ...	78.5 ...	S.E.
Maximum temperature of the day ...			91.0 F.
Minimum ,, ,, ...			75.6
Rain			0

From the above we get the meteorological condi-

tions at Singapore from 3 o'clock p.m. to 9 o'clock p.m., on May 1, 1911, as follows:—

1911	Temperature of Air, F. Dry	Wet	Wind
May 1, 3 o'c., p.m. ...	88.8° ...	80.2° ...	S.E.
,, 4 ,, ...	88.0 ...	79.9	
,, 5 ,, ...	87.2 ...	79.6	
,, 6 ,, ...	86.4 ...	79.3	
,, 7 ,, ...	85.6 ...	79.0	
,, 8 ,, ...	84.8 ...	78.7	
,, 9 ,, ...	84.0 ...	78.5 ...	S.E.

Again, I find the following meteorological record for April 30, 1911, at Singapore, in the *Singapore Free Press*:—

1911	Temperature of Air, F. Dry	Wet	Wind
April 30, 9 o'c., a.m. ...	88.0° ...	79.5° ...	S.E.
,, 3 ,, p.m. ...	86.5 ...	79.0 ...	S.E.
,, 9 ,, ,, ...	83.0 ...	78.5 ...	S.E.
Maximum temperature of day ...			91.8° F.
Minimum ,, ,, ...			75.6° F.
Rain	Drizzle at 8 o'c., a.m.		

From the above we get the meteorological conditions at Singapore from 3 o'clock p.m. to 9 o'clock p.m., on April 30, 1911, as follows:—

1911	Temperature of Air, F. Dry	Wet	Wind
April 30, 3 o'c., p.m. ...	86.5° ...	79.0°	S.E.
,, 4 ,, ...	85.9 ...	78.9	
,, 5 ,, ...	85.3 ...	78.8	
,, 6 ,, ...	84.7 ...	78.7	
,, 7 ,, ...	84.1 ...	78.6	
,, 8 ,, ...	83.5 ...	78.5	
,, 9 ,, ...	83.0 ...	78.5 ...	S.E.

I have now given the atmospheric conditions between 3 o'clock p.m. and 9 o'clock p.m. on four days, that is, on April 30, May 1, 3, and 4, out of the seven in the week ending May 6, 1911, at Singapore, when there was such an extraordinary amount of malarial fever there that the special correspondent felt called on to wire the fact to *The Times*.

Although he added "there has been nothing exceptional in the season to account for it," I think that even the meagre meteorological details I have been able to procure and give above afford a sufficient explanation of the prevalence of fever there, whether malarial or not. For the atmosphere in which the inhabitants were immersed between 3 o'clock p.m. and 9 o'clock p.m. daily, and almost certainly throughout the whole night, was such as must, of itself, raise the body temperature of a large number considerably above normal. To see this it is only necessary to compare the atmospheric conditions at Singapore above given with those which were found to raise the body temperature of the weavers in the cotton sheds of Lancashire, as already given in THE JOURNAL OF TROPICAL MEDICINE, February 15, 1912, page 59. To take only a single example. In the Lancashire cotton sheds exposure to an atmosphere having a dry bulb temperature of 84.0° F. and a wet bulb temperature of 77.0° F., raised the body temperature to 100.3° F. But in Singapore, at 9 o'clock p.m., on May 1, 1911, the dry bulb temperature of the atmosphere being the same, viz., 84.0° F., as in the cotton sheds, the wet bulb temperature was 78.5° F., or 1.5° higher than the wet bulb temperature in the cotton sheds, and this, by the greater impediment which it presents to loss of heat by evaporation, must raise body temperature even higher than the atmosphere in the cotton sheds did. But the atmosphere in the cotton sheds raised the body temperature to 100.3° F.

CLINICAL NOTES ON A CASE OF BACILLARY DYSENTERY, TYPE Y, IN A CHILD AGED 6 MONTHS.

By J. CAMPBELL GRAHAM, M.D.
Deli, Sumatra.

THE occurrence of bacillary dysentery in any form, at this early age, is sufficiently remarkable, but when a decided success can be recorded by what seems the unscientific treatment of type Y by a serum of another type, viz., Shiga's, it shows that the different types must be fairly nearly related; and that it may be worth a trial to use the one serum for the other in case of emergency.

The child, a European, took ill at the beginning of June, 1911, without obvious cause. It had been getting nothing but milk and rice-water, so that infection seemed to be excluded. The stools were frequent and there was much straining with a considerable amount of mucus, and blood in streaks. Under the usual treatment with castor oil, reduction of the food supply to rice-water and tea, there was improvement, but always followed by relapses; the stools averaging about fifteen to twenty-five per day.

On June 7 the temperature rose suddenly to 38·5° C., and continued in spite of treatment by irrigation with normal saline and decoction of simaruba and the exhibition of castor oil emulsion in teaspoonful doses twice daily.

The child became extremely thin and was obviously sinking slowly, partly from toxic poisoning and partly from want of food.

An examination of the stools at the laboratory in Medan now revealed the presence of the dysentery bacillus, type Y. Not having any serum of this type we decided to employ Shiga's, which was obtained freshly made at the laboratory, and I gave a hypodermic of 1 c.c.

The result was so sudden that it cannot be regarded as mere coincidence. The temperature fell from 39° C. to 37·4° C. immediately after the first injection, and remained at about 37·5 for two days. After the second injection the temperature fell to normal after forty-eight hours. The child which had suffered extremely from sleeplessness before, at once obtained quiet sleep four hours after the injection, and practically slept the whole night except on the four occasions when it had a motion.

The day following I injected 1·5 c.c.; after this the child vomited once, but had no other adverse symptoms, and the temperature kept low.

The stools also showed a marked improvement in number and quality. Convalescence was very gradual, but quite uninterrupted.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JUNE 15, 1912.

MEAT INFECTED BY PARASITES.

AN article which we have just received from Dr. Burton Cleland raises a question, important both hygienically and economically. In discussing the subject of the presence of worm nests in the briskets of Australian cattle, Dr. Cleland remarks upon the absence of danger to man from the ingestion of food thus infected. The nests are due to the *Onchocerca gibsoni*, and living embryos have been found in the nodules which can often be felt beneath the skin over the brisket. Laying aside the consideration of the channel by which these parasites are conveyed from one animal to another, or how they enter the human body, a point of extreme interest is the statement as to their harmlessness when present in food consumed by man. Whether this is absolutely the case may not be definitely proved, but allowing that it has been, and that man can consume the infected brisket with impunity, the whole question of meat, altered in some way by parasitic infection, is of importance to the farmer, the butcher, and the consumer. The farmer may be ignorant that an animal is infected by tuberculosis, by *O. gibsoni*, by trichina, or by any other of the many parasites which inhabit the animals which he sells to the butcher; the butcher, as a rule, becomes aware that the flesh, glands, lungs, or other organs are the seat of pathological changes only after the animal is killed, and having paid full price for the animal is tempted to hide the fact that the meat is other than normal and sells it to his customers. The cook may or may not recognize "nests" or other changes in the fat of the meat when the meat is uncooked; and when it has been cooked the pathological changes are seldom recognizable to the consumers. On whom is the blame of the ingestion of infected meat to be laid? The farmer is, as a rule, ignorant that disease is present, but if the animal becomes ill and is seen by the veterinary surgeon the onus must be laid upon him if the meat finds its way to market. The butcher if he has bought a number of animals for slaughter may find the majority infected and the financial loss entailed may be so grave that he passes it on for sale knowing that he runs a chance of being detected in the fraudulent act, but hoping that it may not be detected. The question is, what infections in meat are really injurious to man? The meat is condemned by inspectors at our ports irrespective of whether the infection is known to be deleterious or not, entailing severe loss upon the producer. Is the presence of a parasite and the lesions it entails sufficient to justify condemnation of part or whole? The parasite, (*O. gibsoni*) which infests the brisket of cattle, according to Dr. Cleland, is harmless to man; yet were the nodules it causes detected before the animal is actually purchased from the farmer, they would lower the price of the animal to the farmer, or, perhaps, condemn it altogether.

This often wholesale condemnation of meat brought to our ports is a serious matter, and, although it may be the safe thing to do on the part of the authorities, it not infrequently entails great financial loss or ruin to the unwilling farmer or shipper.

We are as yet uncertain as to whether or not the flesh of an animal infected by tuberculosis is or is not wholesome, nor are we by any means certain that even the milk from tuberculous cows infects man. The problem is a difficult one to settle, but is important hygienically and commercially. Meat is an expensive article of diet, and the loss of many carcases owing to infection, which may be harmless, tends to still further enhance its price. Dr. Cleland's remarks raise an economic question of great importance, and will tend to cause us to review afresh the whole policy at present in vogue, namely, the condemnation of our most expensive food supply, merely because a patch of tissue within the animal shows that it has become the home of a parasite.

WE would remind our readers that the Seventeenth International Congress of Medicine will be held in London, August 6 to 12, 1913. The subjects to be dealt

with by the Section of Tropical Medicine and Hygiene are :—

(1) Relapsing fevers.
(2) Leishmaniasis.
(3) Plague.
(4) Beri-beri.
(5) Sanitary organization in the Tropics.

The Secretary of the Section is A. G. Bagshawe, M.B., B.C.

Annotations.

A New Hæmoglobin Culture Medium.—Row, in the *British Medical Journal*, May 18, 1912, gives details of what he terms a simple hæmoglobinized saline culture medium for the growth of Leishmania and allied protozoa. The technique of this new method proposed by Row is as follows :—

(1) With the usual antiseptic and aseptic precautions about 5 c.cm. of blood are collected from the punctured marginal vein of a rabbit (blood can be aspirated easily to the extent of 5 to 8 c.cm. from one of the superficial veins of the forearm in man—thanks to Major Glen Liston's advice—when human blood is required) and poured into a sterile test-tube containing a few glass beads. The tube is shaken to defibrinate the blood.

(2) The defibrinated blood is now rendered laky by the addition of sterile distilled water in quantity requisite to dissolve all the hæmoglobin available (1 in 8 to 10 of distilled water is found sufficient for the rabbit's blood in Bombay). The hæmolysis may be also induced by repeated freezing and thawing, and is perhaps preferable when a stronger solution of hæmoglobin is required.

(3) The next step is to utilize the laky blood to dilute the NaCl solution so as to ultimately have a strength of 0.8 to 0.9 per cent. NaCl with a fair colour of the hæmoglobin (after a great many experiments this strength has been found to be the best), and for this final admixture the following routine is to be followed.

From a stock solution of 1.2 per cent. NaCl two portions are sucked up with a sterile pipette and nipple and transferred to empty sterile test-tubes of about $\frac{3}{8}$ in. diameter.

These tubes are kept in a water bath at 56° C., and when they are at this temperature one portion of the laky blood is added to each saline tube. This gives a strength of about 0.85 to 0.9 per cent. NaCl. The heating of the saline previously is done with the double object of ensuring sterility and of destroying any complement that may be present in the defibrinated blood.

By this method, with about 5 c.cm. of blood, as many or more culture tubes are made as can be prepared with the sacrifice of a rabbit, and the quantity of the culture fluid is at least 5 c.cm. in each tube, instead of being only 1 c.cm. to 1.5 c.cm. of the N.N.N. medium. The tubes thus prepared are ready for immediate use (after cooling), and from start to finish take twenty to thirty minutes to prepare.

In this culture fluid flagellates flourish and multiply even after five to six weeks, so that subcultures can be made at leisure any time during this period, as the fluid does not get so easily concentrated, as does the condensation water of the N.N.N. medium, which by this time completely dries up owing to the large surface exposed to evaporation by the agar slope.

Row believes that this medium has the following advantages :—

(1) The culture medium can be made at once when urgently required, without any loss of time, as the technique is simple.

(2) The technique involves less labour, and entails no sacrifice of rabbits—that is, it is economical.

(3) Human blood can be used for the preparation of this medium when required for special purposes or for general use.

(4) The fluid does not alter appreciably by age within the limit of four to six weeks, owing to the small surface exposed to evaporation.

(5) A larger quantity of the culture fluid in each culture tube is available, so that when abundant cultures are required—for example, for the preparation of vaccine—this gives a decided advantage.

(6) The culture fluid keeps sterile during the working period of six weeks more easily than does the N.N.N. medium in the tropical laboratories.

A New Tsetse-fly from British East Africa.—Newstead, in the *Annals of Tropical Medicine and Parasitology*, May 29, 1912 (Series T.M., vol. vi, No. 1, B.), describes a new species of tsetse-fly from British East Africa. He proposes to name the fly *Glossina austeni*, n. sp., after Mr. Austen, the great authority on these flies. The following is Newstead's description of the new fly :—

"A small and somewhat slender species belonging to the palpalis group of tsetse-flies, and in addition to its slender form is distinguishable also by its bright ochraceous colour and relatively narrow head. In its general appearance it bears a somewhat close resemblance to a dwarfed specimen of *G. fusca*, Walker, but differs from this or any other member of this division of the genus *Glossina* by the colour of the hind tarsi. Judging by its form alone, *G. austeni*, n. sp., seems more closely related to *G. tachinoides*, West., than any other species, but it is very clearly distinct and cannot be readily confused with any other member of the genus.

"*Female.*—Head buff, relatively narrow; posterior surface grey, frontal stripe buff; ocellar spot dark brown; antennæ and arista similar in form to those of *G. palpalis*, third segment with the apical two-thirds infuscated; proboscis bulb uniformly pale ochreous buff; palpi ochreous buff.

"*Thorax.*—Dusky buff, with dark brown markings similar to those in *G. fucsa*, but with the dark lateral markings forming two rather indistinct, broad, stripes; pleuræ dusky ochreous buff; apical scutellar bristles very short and spine-like.

"*Abdomen.*—Dorsum bright yellowish buff or ochraceous; lateral margins broadly infuscated, the infuscations not extending to the distal margins, but they merge in the middle line on the last two seg-

ments, so that the latter appear almost uniformly dusky; these markings are, however, suggestive of interrupted bands.

"*Legs* pale ochreous buff, femora without streaks or infuscated patches; hairs to the front, middle, and hind coxæ all black; front tarsi unicolorous; tips of the last two segments of the middle tarsi very narrowly darker; all the segments of the hind tarsi dark, but the last two are decidedly darker than the rest.

"*Wings* without any marked infuscations. Length, 7 mm.

"The type and only example is a female, and this is in an excellent state of preservation. It was captured by Mr. P. R. Filleul, Assistant District Commissioner, at Alexandra, Gorha, Jubaland, British East Africa, and forwarded under date March 17, 1912."

The Health of the Canal Zone.—Colonel Gorgas, in submitting his report on the department of sanitation of the Canal Zone for the month of February, 1912, states that the total number of deaths from all causes among employees was 46, divided as follows: Disease, 29, and violence, 17, giving the annual average per thousand of 6.66 and 3.91 respectively.

Among employees for the month of February of each year the annual average death-rate per thousand was as follows: 1905, 14.05; 1906, 29.09; 1907, 30.74; 1908, 12.80; 1909, 9.42; 1910, 8.75; 1911, 9.88; 1912, 10.57.

The annual average death-rate per thousand in the cities of Panama, Colon, and the Canal Zone, including both employees and civil population, for the month of February of each year, was as follows: 1905, 42.07; 1906, 43.96; 1907, 36.07; 1908, 21.40; 1909, 18.59; 1910, 17.50; 1911, 18.60; 1912, 16.33.

In segregating according to race, the annual average death-rate per thousand from disease among employees was: For whites, 4.61; and for blacks, 7.34; giving a general average for disease of 6.66. For the same month during 1910 the annual average death-rate per thousand from disease among whites was 5.20, and blacks, 4.59, giving a general average of 4.73; and in 1911, from disease among whites, 5.67, and blacks, 6.47, giving a general average of 6.27.

Among employees during the month the deaths from the principal diseases were as follows: Nephritis, acute and chronic, 5; dysentery, clinical, 1; hæmoglobinuric fever, 1; lobar pneumonia, 5; malaria fever, 1; tuberculosis, 4; typhoid fever, 1; leaving 11 deaths from all other diseases and 17 deaths from external violence.

No cases of yellow fever, small-pox, or plague originated on or were brought to the Isthmus during the month.

Dermatobia noxialis Infection in Man.—Singleton, of Galveston, Texas, reports a case of *Dermatobia noxialis* infection in man in the *Journal of the American Medical Association*, April 27, 1912. The patient, a labourer, came from Mexico to Galveston three weeks before the time of examination. He had lived in Mexico for six months previously and during this time had had little work to do and lived as a tramp, sleeping out of doors. He said that the flies were very bad, and that many times he was bitten by them; while bathing in a stream he was bitten on the end of the penis a little over a month prior to his visit. A little blood exuded from the bite and swelling soon followed. Since that time there had been a slight swelling of the dorsum of the penis, just behind the corona of the glans. A small scab would form over the bite and then come off, with a brown fluid exuding. This was repeated at frequent intervals. He had suffered continuous pain in the part.

On an examination being made a slight abrasion just in front of the corona of the glans on the dorsal surface of the penis was noticed, and on pressure a drop of pus was expressed. Just behind the glans was a hard swelling, which felt very much like scar tissue. A sound was passed into the urethra, showing it to be free from the tumour mass. The penis was dressed, and the patient requested to return the following day, but he did not do so for two days. At that time there was only a little inflammation about the parts and no pus coming from the opening, but the swelling remained the same. On pressure a white gelatinous-appearing body showed in the opening of the sinus. With a pair of skin forceps this was grasped, and with traction the body elongated and was pulled through the small opening.

It was then readily seen to be a larva of some fly, alive and actively moving. It was ¾ in. in length, club-shaped, and slender posteriorly. Its body was in segments with rows of black hairy bristles or spines on the borders of the upper segments encircling the body. It was glistening white in colour, and had two hooked mandibles and anal breathing pores. The larva was placed on fresh beef and at the end of ten hours was active and alive, but at the end of twenty-four hours was dead, showing that it must have living tissue in which to thrive. It was evidently the larva of *Dermatobia noxialis*, known as the "macow worm" (*ver macaque*, monkey worm). The larvæ live under the skin of men, apes, cattle and dogs as a rule, and in some parts of South America are very common.

The Trypanosome of Gambian Horses.—Blacklock, in the *Annals of Tropical Medicine and Parasitology*, May 29, 1912, contributes a paper on the trypanosomes found in a horse naturally infected in the Gambia. After a careful study of the subject, he concludes that this represents a double infection and not a dimorphous condition of one parasite as was at one time supposed. His conclusions in his own words are:—

"(1) *Horse A*, naturally infected in the Gambia, contained in its blood two distinct species of trypanosome.

"(2) The first trypanosome, the long form, is *Trypanosoma vivax*.

"(3) It appears justifiable to classify the short trypanosome, taking into consideration its morphology, measurements, and the later developments of its animal reactions, as *T. dimorphon, sensu*, Laveran and Mesnil."

Abstracts.

A CRITICISM OF THE RESULTS OF ENGLISH WORKERS ON THE SO-CALLED HETEROGONY IN ANKYLOSTOMA.*

By Professor A. Looss.

(*Continued from p.* 174.)

THE next author who touched upon the question of a heterogonic development of the ankylostoma was Sandwith (1894). In describing the life history of the parasite he says "that a very brief account will suffice, because Giles has traced out very carefully the rhabdite changes. I first cultivated embryos in a garden, but afterwards found it more convenient to keep infected fæces and damp earth in glass dishes in a room, the temperature of which, during June and July, varied from 21° C. to 24° C. In fresh fæces the ova are usually two—to four—segmented, but may contain eight segments, and on the second day I found several already containing living embryos. On the third day several embryos had escaped from their eggs. In the young stage they resemble in structure and habits the free-living rhabdites, and, like them, go on feeding and growing for a considerable time. They then change their skin, either once or several times, and enter upon a stage when they cease to take in nourishment and to increase in size, and then they need to become parasitic. But so long as nourishment in the way of fæces is supplied to them, and they are protected from drought or too great heat, they will continue to live for months in the hope of being swallowed by a man, in whose duodenum they can alone develop into adult worms. On the fourth day the embryo is almost, and on the fifth day quite, free in his sheath." Thus far, the author's statements, though not very lucidly worded, are in the main correct; the "embryos" enclosed in their "sheaths" are evidently the mature larvæ, which had thus developed in five days, as they regularly do in warm weather. The account then runs as follows: "On the sixth day, and later, I found empty eggs from which the embryo had just escaped, but it was not until the tenth day that I caught one in the very act of emerging. On the sixth and following days the embryos were of very varying sizes, all very active and wriggling towards the edges of the cover-glass to escape. On the seventh day I could just distinguish that some of the embryos were females. On the eighth day there were on one slide 30 embryos all alive, and of different sizes, the large sized being now obviously male and female. On the tenth day the eggs were suddenly increased in number, from 1 or 2 to 17 upon one slide, apparently rhabditic, but having the same appearance as the original ova. Upon the same slide were 27 embryos of various sizes, and one ruptured empty sheath. On the eleventh day one slide showed 15 eggs and 25 embryos, all alive but moving very slowly. On the twelfth day there were on one slide 27 eggs, 14 dead embryos, and only 2 alive, and those moving very feebly. I then divided the cultivation into two halves, one half to be moistened with filtered water daily, and a new half to be mixed with the fæces of a healthy man, after negativing anchylostoma by the microscope. On the fifteenth day a slide from the old half showed 5 eggs and 3 dying embryos, while a slide from the new half showed 30 eggs, 6 embryos dead and none alive. On the sixteenth day the old half showed 6 eggs and 4 dead embryos, while the new half had 14 eggs and 7 very lively but very young embryos. This new brood had thus been produced by healthy fæces in four days." In the way here quoted the daily examinations were continued up to the forty-fourth day, and showed that "the addition of fresh fæces would again revive the embryos."

If I read the whole of this account aright one thing seems fairly obvious, namely, that Sandwith at first observed true ankylostoma larvæ which developed to maturity within five days, and after that something else. What this "something" may have been is very difficult to say in the absence of any hint as to the external appearance of both the "embryos" and the "males and females." That the latter could not have developed from the "embryos" surrounded by a "sheath" is clear from the author's own statement that these "cease to take in nourishment and to increase in size," that they "need to become parasitic" and for this purpose "continue to live for months in the hopes of being swallowed by a man." The sexual stages must therefore have come from another source; a conclusion which Sandwith does not seem to have drawn, for no attempt at explaining the provenance of these males and females is made. Nor is there any indication as to what further became of the "embryos" derived from these sexual stages. Personally, I have little doubt that the latter were the free sexual generation of *S. stercoralis*. Free-living nematodes can, I think, be excluded because—apart from the fact that they are a rare occurrence in the ordinary Egyptian garden soil—Sandwith in all his later registrations never again mentions parent worms which, had free-living nematodes been present, must perforce have increased in number with every new generation that arose. There thus remains *S. stercoralis*; it may already have been present in the original fæcal material used in the experiments; it was certainly present in the fæces of the "healthy man" which were added to the preparations. Hence the suggestive temporary increase in the eggs and larvæ after each addition, while free-living nematodes would have brought about a steady increase in the number of individuals. The absence of any data about the structure of the worms makes it impossible to say anything more definite. That under these circumstances the experiment of Sandwith cannot be considered as proof of a heterogony of the ankylostoma at the exclusion of other species present in his cultures is clear; indeed the author himself summarizes his results in the sentence: "The experiment is enough to show that embryos on damp earth in Cairo will live for more than six weeks."

* Being an Abstract from the "Records of the School of Medicine," Cairo, vol. iv.

A few years later, the question of the existence of a free-living generation of the ankylostoma was again touched on in a work by Ozzard (1902). The statements of this author are quite brief and are accompanied by some illustrations which, as compared with those of Giles, are so sketchy that they do not contribute to the elucidation of the text. Ozzard summarizes the results of his observations in the following words: "During the last two years, I have been able to completely confirm the experiments of Lieut.-Colonel Giles with regard to the life-history of the parasite. That this is an example of dimorphism or heterogenesis, I have not the slightest doubt." Since Ozzard, as he admits further on in his paper, "conducted his experiments on exactly similar lines to those described by Colonel Giles," it may be permissible to conclude that he also fell a victim to the errors which I have attempted to explain above. A few small differences as to the duration of the development of the free worms are of no importance, as are some other differences said by Ozzard (and Giles) to exist between *Agchylostoma* and *Strongyloides* with regard to the media in which the larvæ develop or do not develop.

Some very extraordinary statements are to be found in Ozzard's paper on the alleged differences between the free-living generation of the ankylostoma and that of *Strongyloides*. The passage runs as follows: "That there can be any confusion between the sexually-mature forms of *A. duodenale* and *Rhabdonema intestinale* is impossible to any who will exercise a reasonable amount of trouble over the matter. The two worms are quite different. In the free female forms of *A. D.* the ova are arranged in a single row and of an oval shape, usually from 6 to 10 in number; whereas in the female *R. intestinale* the ova are arranged in a double row and are somewhat rhomboidal in shape, with the exception of the lower six or so which are arranged in a single row and appear as if united in a chain." I would first remark that, if these differences, *i.e.*, the number and arrangement of the eggs in the female, represent distinctive characters of independent species, we should perhaps have to divide the species *Homo sapiens* into two, according to whether the children are brought into the world singly or as twins. In reality, such differences can never be used for separating species. Besides, how are we to distinguish in this way those females, for instance, which have not developed eggs or only very few, or the older females where the larvæ become free in the body of the mother, or, finally, how are we to distinguish the males, which do not develop any eggs at all? Actually, the somewhat rhomboidal "eggs" of the *R. intestinale* which are arranged in a double row are not eggs at all. I cannot remember ever seeing such quadrangular eggs in any nematode. Unfortunately, the figure is too poor to allow of even an approximately safe conjecture as to what these structures may really have been.

For these reasons, Ozzard's work cannot be regarded as objective confirmation of Giles's views.

The question as to the existence of a free-living generation of "ankylostoma" was again investigated in a work by Major F. Smith (1905).

When beginning his investigation, Smith was apparently not acquainted with what was known of the development of the ankylostoma; only in the last section of his paper (1905, p. 336) does he discuss the views advanced by Giles and Ozzard, and then proceeds: "Their results, however, have not been universally accepted. Our greatest British authority—Sir Patrick Manson—writing after the publication of their experiments, only commits himself to the extent of saying that 'during rainy weather the ankylostoma ova in the fæcal materials are hatched, and the free embryos escape into, and probably multiply in, the damp earth' ('Tropical Diseases,' 1903). Speaking of Giles's discovery, he remarks that 'his observations, at one time disputed, are now upheld by Sandwith and other observers.' Daniels, on the other hand, in his newly-published 'Laboratory Studies in Tropical Medicine,' 1904, definitely states that there is a free-living form, but gives no particulars, and quotes no authority." So it is conceivable and, in the end, not unjustifiable that the author in the concluding passage of his work complains that "the new generation of students of tropical medicine is being urged to buy books, the latest editions of which either lay down emphatically that there is a free, non-parasitic, sexual form of ankylostoma, or leave the student in doubt." The fact that it is impossible, in places far from the scientific centres of Europe, to consult the original literature in addition to text-books is too well-known to the present writer from his own experience for him to imply any kind of reproach in this direction. Instead, I shall here try to give the information wanting to the author and to explain the points over which he came to grief.

Smith summarizes the object and the results of his work in the following words: "In leaving this subject I must apologize for the lengthy accounts of experiments, for it has to be admitted in the end that the identity of the free-living organism has yet to be established; but it seemed to me highly desirable that an attempt should be made to settle the question one way or the other . . . I feel that my work will not have been wasted if I have shown (and I consider that I have shown it) that the free-living forms mentioned in recent text-books and said by Colonel Giles, I.M.S., Dr. Ozzard, and others, to be derived directly from the embryo of the adult ankylostoma without the aid of an intermediate host have no existence in reality" (1905, p. 342). I would first remark in answer to this that the "lengthy accounts" of experiments are no disadvantage, but, on the contrary, an advantage, as they make it possible for the expert reader to judge of the actual convincing power of the experiments. And, as to the uncertainty of the other results, this is to be ascribed to the same circumstance that led previous authors into error, viz., the insufficient attention to the distinctive characters of the worms themselves.

According to all appearances, the author starts from the view that there is only one species of "ankylostome," and that this species can live indiscriminately in man and animals. This is a first fundamental error. Various animals, it is true,

harbour "ankylostomata," but these are not in all cases of the same species, and cannot be simply transferred to animals other than their normal hosts, or to man.

Smith introduces his paper with a passage on animals "which may pollute our water and surroundings"; he says: "Dogs we know to harbour ankylostomes." This is true, but the "ankylostomes" are not the *A. duodenale* of man. As parasitic in the dog, we at the present time know two distinct species of "ankylostoma" — the *A. caninum* and the *Uncinaria criniformis*. From Thiroux and Teppaz's work (1906) it appears that the *A. caninum*, or a species very like it, is common in dogs on the Senegal river; it is thus probable that is also occurs in Sierra Leone. Whether Smith's "ankylostome of dogs" is one of the two species named, or represents a new, independent species, cannot be said until it has been specifically examined and described. It would therefore have been of great use if the author had microscopically examined the adult worms and briefly described them. Still more important would a microscopic examination of the ankylostomes of man in Sierra Leone have been; our more recent knowledge of the geographical distribution of *Necator americanus* makes it appear very probable that the "ankylostoma" parasitic on human beings in Sierra Leone is not *A. duodenale*, but *N. americanus* (or perhaps both species side by side). Smith ought further to have established whether the ankylostoma of the dog in Sierra Leone is the same which there occurs in man and whether, consequently, the dog can actually pollute water with germs which are dangerous for human beings. According to what is known at present, this is not probable, either with regard to *A. duodenale* or *N. americanus*. Smith says further: "I have found in the fæces of Leicester pigs ova and embryos which in appearance are identical with those of the human parasite." This may be true in itself, but it may safely be affirmed that the eggs and "embryos" in question were not those of *A. duodenale*. I would here recall the alleged ankylostomiasis of the horse (see later, chap. ii, C; 6) In the fæces of the horse, also, eggs were found "in every respect identical with those of *A. duodenale*"; but the conclusions based upon this apparent identity have long been recognized as unsound, as indeed the eggs occurring in the horse did not in every respect resemble those of *A. duodenale* and were not those of *A. duodenale*. "There are probably other animals acting as hosts. A large toad from the water area had live embryos resembling those of the ankylostomum in the fæces, but I found no adult worms in any part of the gut." Very true; but the "embryos" found did resemble those of the ankylostoma only so much as chickens resemble ducklings, and were as little *Agchylostoma* larvæ as ducklings are chickens. That Smith did not find the adult worms in the intestine, is conceivable; he would, however, have found them, had he looked in the lung. For there is every probability that the "embryos" observed were the offspring of a *Rhabdonema*, either *nigrovenosum*, or a relative species. "To what extent ankylostomes are transferable from species to species is, so far, undetermined." This is not correct, but the usual text-books do not give any particulars as to what is known. So we see that the author, at the very beginning of his researches, starts from certain presuppositions which do not correspond with the actual facts, and so the fate of the whole work is essentially decided beforehand.

In describing the ways in which human beings may possibly become infected, the author says: "It has been stated by other observers that the embryos die off quickly in water, and that this fluid is therefore unlikely to be a means of infection. The circumstances, for all that, seem to point to water infection." This statement rests upon a misconception. The unfortunate use made of the word "embryo," especially in English works, is here responsible for the confusion. We shall see more clearly later that the "young larvæ" which come from the eggs of the ankylostoma are, under certain conditions, very sensitive to water and perish in great numbers in much diluted cultures. After they have developed into "mature larvæ," however, water is their actual life-element and, in the process of infection, plays an indispensable part, though not exactly as drinking water. With regard to desiccation, Smith says that the larva "withstands drying. The application of water brings it to life." The experiments upon which Smith founds this conclusion, or at least some of them, seem, if I rightly understand the text, rather to support the opposite view.

The author then reports a specially interesting observation concerning the occurrence of *A. caninum* in young dogs. Ankylostoma eggs were found in the fæces of dogs eight weeks old, which had been born in the officers' mess, and also in pups three or four weeks old, which had been bought from a native; eventually, a pup eight days old, which up to that time had been fed entirely with its mother's milk, when dissected, was found to harbour four ankylostoma worms. "It is absolutely certain that this pup was not infected through drinking water." There can, indeed, be no doubt about this. To the way in which this animal probably was infected, I shall return later.

We now come to the experiments made by the author to investigate the further fate of the "embryos"; I can, of course, only give the more important of them. First, ankylostoma infected fæces of the dog were cultivated on agar; the "embryos" appeared and grew rapidly. "There were noticed also in the agar some similar organisms which showed sexual distinctions; others were filariform and asexual." The former subsequently developed into males and females which again produced eggs and young larvæ; unfortunately, nothing is said as to the further fate of these latter, which prevents any correct judgment of the experiment; all the more so as the figures accompanying the work are very diagrammatic: not so much so as those of Ozzard, but yet not nearly so clear and legible as those of Giles. In any case, the experiments here alluded to clearly revealed two different forms; male and female sexual animals and sexless, filariform larvæ. A few other experiments have to do with the influence of drinking

water on the "embryos." In one, the eggs taken from the adult female were cultivated in water; here, therefore, there was absolute certainty that the "embryos" came from ankylostoma eggs. They developed, but remained sexless and soon died off. Fæces from human beings treated in the same way also yielded only sexless larvæ, which, however, remained alive longer (eight weeks). Fæces of dogs again yielded only asexual larvæ, which remained alive for three months. The author concludes from these experiments that "drinking water does not kill the embryos." This is true, but still more important is it that only asexual larvæ develop from genuine ankylostoma eggs and that, under certain conditions, only such larvæ are also obtained from the fæces of human beings and of dogs.

The next experiment is of quite special interest; I quote verbally: "Human fæces containing ova and young embryos were placed in tap water. For more than two months asexual embryos only were found in the water. The water was then allowed to almost dry up. When three months old, the preparation consisted of green algæ not quite covered with water. A few attenuated parents, similar to those already described were moving about in it. There were also some young embryos. Here and there an egg was to be seen. The organisms were evidently maintaining a precarious existence. They were removed to glucose-agar, in which they bred rapidly and grew to robustness." The result of this experiment is quite correctly explained by the author as due to subsequent pollution of the culture by foreign organisms; the vehicle of this pollution being assumed to be a fly. What the author has apparently not noticed is that the newly added organisms went on reproducing themselves generation after generation, and thus did not produce larvæ which remained asexual for any length of time.

Smith then describes in detail the peculiar tendency of the mature ankylostoma larvæ to protrude above the surface of the cultures in agglomerations which appear to the naked eye as threads of cotton, polyps, or small flames moving to and fro, a phenomenon first observed and described by Van Durme in the case of larvæ of *S. stercoralis* (1902) and later also observed by me in connection with *A. duodenale* and *caninum*. Smith makes a close study of this peculiar behaviour of the larvæ and describes it well. He shows that, under certain conditions, the larvæ undertake real migrations in common, and therefore calls these larvæ "travellers." An attempt made to bring the "travellers" to reproduce themselves in agar or water failed, but the author is "not yet sure whether or no they can take on parental functions as a free form." I am not quite clear as to what these words mean; the same is the case with a remark on the appearance of the "organisms," of which the author writes that "their size and appearance vary a good deal. There is some evidence that they may become short-tailed, or rather tailless, and be brought back to the tailed condition by suitable nutriment"; it being not clear to me whether the word "organisms" here refers to the "breeding forms" or the "travellers." "Travellers" placed upon bread or a piece of banana remained alive for several days, but no reproduction seems to have taken place, whereas they multiplied in "ideal milk" and on cold beef; the milk becoming sour during the experiment and the beef putrid. Thus, the general result was that "travellers" could be brought to reproduce themselves under certain circumstances, but not under others.

(To be continued.)

PRIMITIVE TRIBES AND TUBERCULOSIS.*

By Major S. L. Cummins, R.A.M.C.

Major Cummins said that some years ago, when engaged in preparing a paper on Tuberculosis in the Egyptian Army, he was struck by the fact that the incidence of this was much higher amongst the Sudanese than the Egyptian troops. The paper in question duly appeared in the Service Number of the *British Journal of Tuberculosis*, published in January, 1908, but he might quote some figures from it to illustrate the point in question.

For the five years from 1902 to 1906 inclusive the average annual incidence amongst the Sudanese was 3·7 per 1,000, whilst amongst the Egyptians it was only 1·5 per 1,000.

This difference was significant, but the contrast was much more intense in Cairo, where the climate was colder and where town conditions obtained. During twelve months in 1906-7, fifteen acute cases of tubercle of the lungs came under his notice. Of these, ten were either transfers from other stations or admissions from the Egyptian garrison of about 3,000. No less than five cases, or one-third of the total, were contributed by a small detachment of sixty or seventy Sudanese artificers stationed at the Citadel for instruction.

An Egyptian medical officer, to whom Major Cummins mentioned these points, told him that this great liability of the Sudanese to tuberculosis was well known in Egypt, so much so that Shilluk and Dinka slaves were the cheapest in the market, as it was assumed that a large number would contract the disease and die.

Von Becker had called attention to the small incidence of tuberculosis amongst Egyptians in Egypt and contrasted it with the intense susceptibility to the disease shown by Berberines, and still more by Sudanese, when the latter are under Egyptian conditions of life. On the other hand, the Sudanese soldier's great liability to the disease is accompanied by an almost complete absence of it amongst the primitive Sudanese tribes in their natural surroundings, and by a corresponding absence of tubercle in the herds of the Sudanese cattle-owning tribes. In Major Cummins' experience, as well as in that of several brother officers who had served in the Bahr-el-Ghazal, no cases of tuberculosis had been seen in natives except in the vicinity of Government posts, where contact with the troops was frequent. At the time of writing

* A paper read before the Society of Tropical Medicine and Hygiene, May 17, 1912.

the paper which has been mentioned, there remained some doubt as to whether the observations mentioned dealt with a sufficient number of wild tribesmen to be of significance. But more recent information left no room for doubt on this point. Captain R. G. Anderson, R.A.M.C., stating: "Amongst the Nyam-Nyam and Gours I did not meet with a single even suspicious case."

To reiterate, then, the Egyptian soldier proceeding to the Northern Sudan from Egypt—a country where tuberculosis is apparently common—has a decidedly low tubercular case incidence, whilst the Sudanese soldier, recruited from the southern tribes amongst whom tuberculosis is rare or absent, shows under military conditions a case incidence which is decidedly high.

This apparent paradox is by no means an isolated instance, but appears to be the expression of a great rule in the epidemiology of tuberculosis.

McVicar, writing on tuberculosis in South Africa, calls attention to the high incidence of the disease amongst coloured people when in contact with Europeans, and mentions that "in the interior, especially in the Transvaal and on the Upper Zambesi, tuberculosis is almost unknown," at the same time, the tubercle death-rate amongst white compares favourably with that in European countries, being 1.4 per 1,000 in thirty-five towns of Cape Colony, 1 per 1,000 in Natal, 1.37 per 1,000 in Orange River Colony, as compared with 1.62 per 1,000 in England and Wales during 1902.

The average death-rate of coloured people in six towns of the western province of Cape Colony was over 8.6 per 1,000. So that here there is an exact analogy to the Sudanese paradox.

The European, coming to South Africa from a country where tuberculosis is common, has a low incidence from that disease, while the native, coming from the interior where tuberculosis is rare or absent, displays, when he mingles with the European, an intense liability to tuberculosis.

The rarity or absence of tuberculosis amongst natives in Central and German East Africa has been noted by R. Koch and by German colonial medical officers.

Römer has recorded similar observations from the pampas of the Argentine, where tuberculosis is rare amongst the inhabitants. They suffer severely from it when they settle in the towns, much more severely than people of the same race permanently domiciled in the cities of Buenos Ayres.

The North American Indian affords another terrible instance to the same effect. Thus, writing on Kleb's work on "Tuberculosis," Dr. Thomas D. Coleman says: "It is generally conceded that pulmonary tuberculosis was unknown in the Indian in his barbaric state—at least, that it was a disease of rare occurrence." Then, giving examples of the present incidence of the disease amongst these people: "In 1896 there were altogether 4,893 Oglalas, of whom 741 were tuberculous, and of these 124 died in one year. That is, 148.7 per 1,000 were tuberculous and the annual death-rate was 24.88 per 1,000." Dr. Coleman gives other examples as striking and as terrible as this one.

America furnishes another illustration in the case of the negroes. These Africans, under the old slave *régime*, lived on the plantations under much the same conditions as in their native homes, with the difference that, being valuable property, they were carefully looked after by their owners. Coleman says the medical profession in the South is unanimous in the opinion that in the negro's condition of slavery tuberculosis was practically unknown."

In 1900, however, the state of things had become very different. "In the cities of the South, with a negro population ranging from 27 per cent. to 56 per cent., the death-rate of the negroes from consumption is two or three times that of the white: in Boston 7.4 per 1,000 in negroes and 2.3 per 1,000 in whites; in New York, 5.2 per 1,000 in negroes and 2.3 per 1,000 in whites; and so on.

Major F. Smith, D.S.O., has called attention to a similar high incidence amongst the men of the West Indian Regiments, both in the West Indies and when stationed at Sierra Leone, as compared with the incidence amongst European troops in the same stations, and also as compared with that amongst the West African Regiment recruited from the natives of the West Coast. The latter comparison might be misleading if it were not borne in mind that the high mortality amongst West Indian troops stationed at Sierra Leone is not the expression of their response to tuberculosis contact on the West Coast, but of their previous contact with it under West Indian military conditions; an exposure evidently much greater than that to which the recently raised West African troops have been subjected.

A final instance is that of the Tartar Kalmuks, recently investigated by Metchnikoff, Burnet and Tarassevitch. This nomadic tribe, fifty years ago, was practically free from tuberculosis, but, under the influence of gradually increasing contact with the Russians, it is becoming more and more infected with the disease. Still, however, cases are rare in the central parts of the area inhabited by the tribe, and still the same phenomenon as has been noted above in the Sudan is displayed by the Kalmuks at the periphery of their country, where foreign contact is the rule—a very great susceptibility to the disease. So much is this the case, that students in the colleges at Astrakhan very seldom complete their studies, being obliged to cut them short through infection with tuberculosis, and the shutting up of several schools and their transfer to the interior of the country is now contemplated. Other instances to the same effect could be given, but it is unnecessary to labour the point, which is made sufficiently clear by those already quoted. There is, then, much reason to believe: (1) That man living under primitive conditions is practically free from tuberculosis; and (2) that man when brought from a state of primitive existence and placed in contact with civilization shows a very much greater liability to tuberculosis than does civilized man himself.

The question then arises whether the second of

these propositions is a result of the first; whether, in short, primitive man owes his liability to the disease to the fact that, having no previous contact with the tubercle bacillus, he is, as it were, virgin soil for that organism.

The latter is the explanation that has suggested itself to Major Cummins when investigating the incidence of tuberculosis in the Egyptian Army. The increased incidence might, however, be explained in some other way.

Is it not natural to suspect that these wild people on being placed under the clothed, housed and overcrowded conditions of civilization should rapidly deteriorate? Yes, but why specially through tuberculosis? And it is open to question whether the sanitary surroundings of primitive man are ideal. It must not be supposed that the savage insists on over 600 cubic feet of air-space in his hut or tepee. The Dinka hut has only one opening, a door, entered by creeping on the hands and knees!

The building measures about 12 ft. by 12 ft., and it is usual to light a fire in it at night as a precaution against mosquitoes. I should not like to say how many people occupy it, but limitation of families has not yet become a problem in the Bahr-el-Ghazal.

It is not to be denied, however, that uncivilized man usually makes a change for the worse in regard to his surroundings when he comes to or is reached by civilization, but while this might explain his being *as* liable to tuberculosis as the civilized people with whom he mingled, it could not account for his being much more so.

So far, then, the facts are in favour of the virgin soil theory. But this theory commits one to an inference. If the Sudanese, for instance, is liable to tubercle because he is virgin soil, then the healthy Egyptian or European must present to the tubercle bacillus a soil that is other than virgin.

It is not enough to say that he has had contact with tubercle. The contact must have involved a struggle, the struggle must have ended in victory—temporary or permanent—for the human organism over the tubercle bacillus. And this victory can only be expressed in terms of a relative immunity to the bacillus. Is there, then, any evidence that such a victory has been obtained by the average healthy civilized man?

Perhaps the most striking evidence is that of Nägeli and of Burghardt, dealing with the *post-mortem* findings of large numbers of persons dying from all causes.

Both these observers have shown that the percentage of persons with tubercular lesions gradually rises in different age-groups, attaining to 92 per cent. (Burghardt) or 96 per cent. (Nägeli), between the ages of 20 and 90 years. In other words, a large number of persons in civilized communities have contracted and overcome focal infections.

But it may be objected that these were hospital cases, and that results founded on such material cannot be applied to the general population.

Fortunately there is evidence available upon this point also. The Von Pirquet cutaneous tuberculin test, and the ophthalmo-reaction of Calmette, provide a specific method of ascertaining whether persons have or have not tubercular deposits in their tissues. These tests, applied to healthy people, demonstrate that a large proportion of adults in European countries react to tuberculin. Thus Mantoux and Calmette, Grysez and Letulle have shown that from 80 to 90 per cent. of adults in Paris and in the neighbourhood of Lille give a positive reaction to the cutaneous test. Franz, having examined a number of Austrian soldiers, reports that nearly 68 per cent. responded to from 1 to 3 mgm. of tuberculin; and he believes that a much higher figure would have been reached had a larger dose been used.

On one occasion, Major Cummins, when asked to apply the Von Pirquet test in the diagnosis of cases at Netley Hospital, selected ten apparently non-tubercular soldiers as a "control." They were carefully examined to exclude clinical manifestations, and their medical history sheets showed no suspicious entries during their service. Nine out of the ten gave a decided cutaneous reaction.

So much for adults, but the picture is quite different when it comes to children. Von Pirquet's beautiful observations on this point make it clear that while hardly any healthy infants respond during the first two years of life, the number that react to the test rapidly rises with increasing age, until at between thirteen and fourteen years the percentage amounts to the same figure as that for adults—80 to 90 per cent. It is clear, then, that the adult European is in no sense of the word virgin soil for the tubercle bacillus.

But what of primitive man? Has he been subjected to such tests? The information on this point requires to be supplemented by much additional research, but what work has been done all points to the conclusion that primitive adults only react in small numbers.

For instance, Wagon applied both the cutaneous and the ophthalmic reactions to one hundred natives at Kindia in French Guinea, with the result that he obtained only twelve positive results. Of the twelve persons responding to the test, eleven had left their country and been much in contact with Europeans. Peiper has obtained similar results in German East Africa. It must be remembered, however, that the skin of the negro may possibly to some extent obscure the response to the Von Pirquet test. This objection cannot be urged against the very important researches of Metchnikoff, Burnet and Tarassevitch amongst the Kalmuk Tartars.

The Kalmuks at the periphery are tending to lose their nomadic habits and becoming associated with Russians to an increasing extent. The number of positive reactions in adults at the periphery was 82 per cent., or about the same as amongst civilized Europeans, while in the more central parts of the country, away from much foreign contact, the proportion in adults was only 50 per cent.

It will be seen that there is reason to believe that while the healthy adult who has grown up in civilized surroundings has, in 90 or more per cent.

of cases, a demonstrable but isolated and harmless tubercular focus somewhere in his body, the African, under the natural conditions of his own country, is demonstrably free from such foci in 80 or 90 per cent. of cases; while races, like the Annamese and Kalmuk, subjected in increasing degree to contact with civilization, occupy an intermediate position.

Now, since a latent tubercular focus must have been rendered latent by the acquisition of sufficient immunity to prevent its spread, and must usually be kept latent by the acquired anti-bacterial properties of the body-fluids, the 96 per cent. of latent tubercular lesions found by Nageli means that 96 per cent. of the people whom he examined possessed or had possessed a certain degree of immunity to tubercle bacilli, and the 80 or 90 per cent. of Africans that failed to respond to Wagon's tuberculin tests were demonstrably wanting in such an immunity.

Here, then, are the conclusions to which Major Cummins believes we are driven if we accept the virgin soil theory :—

(1) That primitive tribes are highly susceptible to tuberculosis, because, in the absence of the tubercle bacillus, they have never been obliged to protect themselves against that organism.

(2) That civilized peoples are highly protected against tuberculosis because they have, in contact with the tubercle bacillus, elaborated protective substances against that organism.

The first proposition lays upon us a duty and the second opens to us the hope of fulfilling it with success.

The duty is one that lies in a very special degree upon the Fellows of this Society, since our work lies so largely amongst the primitive tribes of the Colonies and Dependencies of this great Empire. If it is true that the African, for instance, is specially liable to tuberculosis, then it will spread rapidly in the Sudan, in Uganda, in East Africa, when once it is introduced. Our efforts should be directed to keeping it out, by stringently forbidding the country to invalids seeking a climate suitable for early tuberculosis, by invaliding every official who contracts or develops tubercular disease, and above all by detecting and isolating early cases amongst the natives.

Again, in the case where the natives leave their country to take service in our regiments or to seek employment in our industries, we should protect them as far as possible from contract with tuberculosis by a rigid inspection and selection of their officers, instructors and overseers, by careful attention to their housing and general sanitation, and by strict regulations that invalids passed out of the service for tubercular disease are not sent back to their native villages.

The problem of getting rid of tuberculosis where it has once gained a secure footing is perhaps too difficult for solution, but it may not be beyond the power of foresight and organization to keep it from gaining a footing in countries where it has not yet appeared. Even a very susceptible person cannot get tuberculosis unless he comes in contact with the tubercle bacillus, and much may be accomplished on these lines, especially where there is not great density of population.

There is much, then, to be done in the direction of protecting susceptible races from contact with the bacillus; but it must be admitted that the task will be more and more difficult as civilization overflows its confines on the one hand, and as native populations increase under the conditions of peace and material prosperity that our administration brings to them on the other. The more difficult the problem, the more skill and knowledge do we require to bring to it; and knowledge is only gained by *research*.

Many further questions would well repay organized research. But, above all, research is needed in the direction of the artificial protection of susceptible people by means of inoculation. If the inhabitants of countries where tuberculosis is widespread tend to acquire an immunity against the disease, the prospect of reproducing this phenomenon by measures under accurate control cannot be quite hopeless. Nature is rough and ready in her methods, and her process of immunizing a race is fraught with many an overdose and many a "negative phase." Perhaps it is presumptuous, but may we not venture to hope for better results in working scientifically alone the lines that she has indicated? Work is being done in this direction already. Von Behring has attempted to immunize calves, and promising results have been sustained in the case of man himself. The attempt to immunize susceptible persons coming from primitive tribes to our armies or to our mines might lead to results of far wider importance than any question of purely tropical medicine.

Report.

THE FIFTH ANNUAL REPORT OF THE COUNCIL OF THE SOCIETY OF TROPICAL MEDICINE AND HYGIENE.

Meetings and Housing of the Society.

During the year ending March 31, 1912, the Society has continued to meet at the house of the Medical Society of London, 11, Chandos Street, Cavendish Square, W., and with the exception of the months of April, July, August, and September—when the Society is in vacation—meetings have been held regularly every month. On March 15, 1912, by the kind invitation of the Commandant and other officers of the Royal Army Medical College, a highly successful meeting was held at their Laboratory at Millbank, S.W. There has been an average attendance of fifty-five Fellows and visitors, and the accommodation and arrangements for the convenience and comfort of the Fellows have continued to be highly satisfactory. The use of the Reading Room, which, by the courtesy of the Council of the Medical Society of London, was

recently extended to all Fellows of the Society of Tropical Medicine and Hygiene, has been much appreciated; and the privilege of consulting the numerous medical publications and reviews received by that Society, as well as the reprints, journals and exchanges of this Society, has been widely utilized by the Fellows.

At the Annual General Meeting which was held on June 16, 1911, the President-Elect, Sir William Leishman, was installed by the retiring President, Sir Ronald Ross; Sir Havelock Charles was elected Vice-President, and the Treasurer, Auditors, and Council of the Society were appointed to hold office for the ensuing two years. After the meeting the Fellows dined together at the Trocadero Restaurant, Piccadilly, Circus, W.

Papers and Demonstrations.

The following papers—many of them illustrated by epidiascope demonstrations and the exhibition of microscopic and other specimens—were read at the various meetings during the year: "Possible Developments and the Future Scope of the Society" (the President), "The Nature of Zambesi Fever" (Dr. Bruce), "The Streptothrix of White Mycetoma" (Dr. Surveyor), "The Present Position of the Quinine Prophylaxis of Malaria" (Dr. Carnegie Brown), "Alastrim or Milk-pox" (Dr. Ribas), "Recent Additions to our Knowledge of Sleeping Sickness" (Dr. Bagshawe), "The Etiology of Beri-Beri" (Dr. Schaumann), "The Etiology of Beri-Beri" (Professor Axel Holst), "Epidemic Dropsy in Calcutta" (Major Greig), "Pellagra in Nyasaland" (Dr. Stannus), "Pellagra in Thirty Southern States of America" (Dr. Sandwith), "Filariasis in Fiji" (Dr. Bahr), "Early Experiments in the Cultivation of the Leprosy Bacillus" (Dr. Abraham), "The Treatment of Leprosy" (Professor Deycke), "The Experimental Production of Leprosy in Animals" (Dr. Much), "Recent Advances in our Knowledge of Leprosy" (Dr. Marchoux), and "The Experimental Cultivation of the Leprosy Bacillus" (Dr. Bayon). At the Laboratory meeting the following demonstrations were given: "A Rapid Method of Diagnosing Malarial Parasites in Blood" (Dr. Cropper), "Spirochætes in a Form of Ulcer observed in Persia" (Dr. D. W. Carr), "Schistosomum Japonicum" (Fleet-Surgeon Bassett-Smith), "The Development of *Filaria immitis* in the Mosquito" (Dr. Low), "*Schistosomum japonicum* and other Blood Parasites" (Dr. Kerr), "*Trypanosomum rhodesiense*" (Dr. Stephens), "Various Entamœbæ" (Dr. Carnegie Brown), and a series of specimens illustrating kala-azar, tick fever, malaria, ankylostomiasis, and other parasitic infections were shown by the President, Major W. S. Harrison, Major Cummins, Captain Kennedy, and other officers of the Royal Army Medical Corps.

Fellows.

During the year Dr. S. T. Darling, Panama; Dr. Charles Nicolle, of Tunis, and Dr. Hans Ziemann, of Berlin, were elected Honorary Fellows. One hundred and fifty-nine candidates were admitted as Fellows, making a total of 723 Fellows elected since the formation of the Society. The Council record with regret the death of the following Fellows: Sir Rubert Boyce, F.R.S., Liverpool, and Dr. Thomas Rennie, formerly of Foochow.

Transactions, Publications, &c.

In accordance with the decision of the Council, the scope of the *Transactions* has been greatly extended, and the Editorial Sub-Committee are now prepared to consider papers, reports, reviews, notes of cases, and other articles of interest on subjects connected with tropical medicine with a view to their publication. Every effort is made to obtain full and accurate reports of all discussions and debates, and to secure the reproduction as far as possible in *facsimile* of the more important drawing, colour sketches and illustrations which are shown at the meetings of the Society. During the year eight issues of the *Transactions*—one after each meeting—were published, and copies were posted regularly to every Fellow. Arrangements have recently been completed with Mr. H. K. Lewis, 136, Gower Street, W.C., for the sale of the *Transactions* to the public, and copies of the current issues are supplied by him to non-Fellows at the price of 3s. 6d. each. A Year Book, containing information as to the work and objects of the Society with a full list of officers and Fellows, was published on September 1, 1911, and was widely circulated.

If Fellows fail to receive their *Transactions* regularly, they should communicate with the Joint-Secretaries at 11, Chandos Street, Cavendish Square, London, W., as soon as possible, but their attention is drawn to the fact that no *Transactions* are published for the months during which there are no meetings of the Society, and that it is essential to give prompt notice of any change of address. A title page and table of contents for each volume is issued with the Year Book, and loose covers for binding will be supplied on application to Messrs. J. C. Phelp and Son, 64, Beulah Road, Walthamstow, London, E., at the price of 1s. 6d. each, post free (inland), or if the copies are sent to them for binding, 2s. 6d. complete.

Future Arrangements.

It is highly desirable that there should be in London a convenient Library with microscopes and a comfortable Reading Room where Fellows and others who are interested in tropical medicine may meet at any time, and where specimens and objects of interest may be shown, and it is hoped that arrangements will shortly be concluded by which such accommodation may be provided for the regular use of the Fellows. A library is gradually being collected, and three microscopes, with the latest improvements, have recently been purchased by the Council, but they regret that, so far, they have been unable to find at a reasonable cost quarters which would be suitable for the use of the Fellows.

Local Secretaries.

During the year the local Secretaries have continued to render valuable assistance in extending the

usefulness and influence of the Society, and Fellows resident in districts which are as yet unrepresented by local secretaries who are willing to take an active part in the work of the Society in this capacity are invited to communicate with the Joint-Secretaries.

Notes and News.

THE *Dublin Mail* of June 3, 1912, states that a coroner's jury has recommended Dr. Albert Hoops, of the Colonial Medical Service, to the notice of the Royal Humane Society for gallantry in attempting to save life recently in Dublin. Dr. Hoops jumped into the River Liffey with all his clothes on in order to try to save a boy, aged 5, who had fallen into the water and was drowning. With the aid of a lifebelt Dr. Hoops got the boy out and applied artificial respiration, but without result. The tide was full at the time and a very strong current was running, facts which add to the merits of the rescue. Dr. Hoops is an old student of the London School of Tropical Medicine. He also served as a medical officer in the South African War, where he was severely wounded. He was mentioned in despatches, and won a medal and four clasps. He is now State Surgeon and Inspector of Prisons at Kedah, Malay Peninsula.

Notice.

A NEW SCHOOL OF TROPICAL MEDICINE.

THE *Indian Medical Gazette* for May, 1912, states that Calcutta is going to start a School of Tropical Medicine of its own. The writer of the article goes on to say that: "In view of the unique advantages which Calcutta possesses in her great hospitals and Medical College, it has long been an anomaly that medical men with Indian experience have to go to London or Liverpool in order to obtain a diploma in Tropical Medicine. This will shortly be remedied when the new School of Tropical Medicine is started in Calcutta, with a degree in the subject at the University. The course will be held during the cold weather months, when the city is at her best, while it is expected that the degree will be recognized as qualifying for accelerated promotion, and that study leave will be granted to Service officers to enable them to attend the school. A new biological laboratory is to be built, together with a number of research rooms to enable the many important diseases prevalent in our hospitals to be vigorously studied under the most advantageous conditions, which will include a working room kept at a temperature which will allow of gelatine media being used all the year round. Courses of lectures will be given in Tropical Medicine, in the pathology of tropical diseases and in those parts of biology which are essential, including a study of disease-conveying insects, intestinal and protozoal parasites, &c. In time students should be attracted from other countries as well as from all parts of India. It is hoped that the vast amount of clinical material in the European General Hospital may also be utilized for teaching purposes, while it would be a great advantage if the former system can be reverted to of all Indian Medical Service officers being sent to Calcutta for a course of instruction in Tropical Diseases on first coming out to India. In short, the possibilities of the new institution are unlimited, and in due time it can scarcely fail to make Calcutta the metropolis of the world as far as the study of Tropical Medicine is concerned."

Personal Notes.

INDIA OFFICE.

From March 16 to May 18.

Arrivals reported in London.—Lieutenant-Colonel E. Jennings, I.M.S., B.; Captain J. H. Horton, I.M.S.; Captain W. W. Jeudwine, I.M.S., B.; Lieutenant-Colonel H. B. Melville, I.M.S.; Captain W. H. Riddell, I.M.S.; Lieutenant-Colonel W. R. Edwards, C.M.G., I.M.S., B.; Captain G. Fowler, I.M.S., B.; Major H. J. R. Twigg, I.M.S., Bo.; Lieutenant-Colonel C. F. Fearnside, I.M.S.; Captain R. F. Hebbert, I.M.S.; Captain A. A. C. McNeill, I.M.S.; Major de V. Condon, I.M.S., B.; Major A. E. Walter, I.M.S., B.; Major J. Stephenson, I.M.S., B.; Colonel H. F. Cleveland, I.M.S.; Major F. D. Browne, I.M.S.; Captain F. R. Coppinger, I.M.S.; Captain C. F. Marr, I.M.S.; Major J. H. Hugo, I.M.S., B.; Captain C. A. Gill, I.M.S., B.; Major D. N. Anderson, I.M.S.; Captain W. N. Boucher, I.S.M.D.; Captain G. C. L. Kerans, I.M.S.; Major E. C. MacLeod, I.M.S., B.; Captain J. R. J. Tyrrell, I.M.S., B.; Major G. Browse, I.M.S.; Captain C. A. Gill, I.M.S.; Captain F. F. Strother Smith, I.M.S.; Captain W. D. Keyworth, I.M.S.; Lieutenant-Colonel G. H. Baker, I.M.S., B.; Lieutenant-Colonel A. W. T. Buist, I.M.S., B.; Major H. Ainsworth, I.M.S., B.; Major C. C. S. Barry, I.M.S., B.; Lieutenant-Colonel C. A. Johnston, I.M.S.; Captain C. H. Brodribb, I.M.S.; Captain W. J. Simpson, I.M.S.; Lieutenant-Colonel J. L. T. Jones, I.M.S., Bo.; Lieutenant-Colonel H. R. Woolbert, I.M.S., B.; Major E. J. Morgan, I.M.S., B.

Extensions of Leave.—Lieutenant V. P. Norman, I.M.S., 6 m., M.C.; Captain J. W. Little, I.M.S., B. 1 m.; Captain R. B. Lloyd, I.M.S., 3 m., M.C.; Captain F. T. Thompson, I.M.S., 6 m., M.C.; Captain J. W. H. Babington, I.M.S., 6 m.; Lieutenant A. MacD. Dick, I.M.S., 4 m. M.C.; Captain J. McPherson, I.M.S., B., 4 m.; Lieutenant-Colonel J. Chaytor-White, I.M.S., B., 6 m., M.C.; Captain R. D. MacGregor, I.M.S., B., 6 m., M.C.

LIST OF INDIAN CIVIL OFFICERS ON LEAVE (INCLUDING MILITARY OFFICERS UNDER CIVIL RULES).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Ainsworth, Major H., I.M.S., Punj. Med. Dept., 6 m., April 1, 1912.

Baker, Lieutenant-Colonel G. H., I.M.S., U.P. Med. Dept., 24 m., April 3, 1912.

Barry, Major C. C. S., I.M.S., Burma Med. Dept., 8 m. 12 d., April 4, 1912.

Buist, Lieutenant-Colonel A. W. T., I.M.S., Punj. Med. Dept., 19 m., April 14, 1912.

Edwards, Lieutenant-Colonel W. R., C.M.G., I.M.S., India Foreign, 12 m., Oct. 9, 1911.

Fowler, Captain G., I.M.S., C.P., 12 m., March 1, 1912.

Fraser, Capt. F. C., I.M.S.

Gill, Captain C. A. I.M.S., Punj., 18 m., March 19, 1912.

Hugo, Major J. H., I.M.S., Central India (Foreign Dept.).

Jennings, Lieutenant-Colonel E., I.M.S., U.P. Gaols, 24 m., Feb. 2, 1912.
Jeudwine, Captain W. W., I.M.S., Punj., 24 m., Feb. 27, 1912.
Jones, Lieutenant-Colonel, J. L. T., I.M.S., Bo. Mint, 7 m., April 13, 1912.
Leicester, Major J. C. H., I.M.S., B., 24 m., November 8, 1910.
MacLeod, Major E. C., I.M.S., E. B. & A. Med.
Megaw, Major J. W. D., I.M.S., B., 15 m., Dec. 4, 1911.
Stephenson, Major J., I.M.S., Professor of Biology, Government College, Lahore, 5 m. 24 d., March 23, 1912.
Sykes, Lieutenant-Colonel W. A., D.S.O., I.M.S., Beloochistan, 19 m. 1 d., Dec. 16, 1910.
Twigg, Major H. J. R., I.M.S., Bo., Prisons, 12 m., Jan. 13, 1912.
Tyrrell, Captain J. R. J., I.M.S., India Foreign, 12 m., April 5, 1912.
Walker, Captain E. A., I.M.S., Burma, 24 m., June 10, 1911.
Walter, Major A. E., I.M.S., Supt. X-ray Inst., Dehra Dun.
Whitmore, Captain A., I.M.S., Burma.

LIST OF INDIAN MILITARY OFFICERS ON LEAVE.

Showing the Name, Regiment, or Department, and the Period for which the Leave was granted.

Anderson, Major D. N., I.M.S.
Boucher, Captain W. N., I.S.M.D.
Brodribb, Captain C. H., I.M.S., 18 m., from March 15, 1912.
Browse, Major G., I.M.S.
Cleveland, Colonel H. F., I.M.S.
Coppinger, Captain F. R., I.M.S.
Earle, Major H. M., I.M.S., 12 m., from June 24, 1911.
Fearnside, Lieutenant-Colonel C. F., I.M.S.
Fitzgerald, Captain D.C.V., I.M.S., 1 y., from June 4, 1911.
Gamlen, Captain R. L., I.M.S., 6 m., from Feb. 14, 1912.
Gilbert, Lieutenant-Colonel C. E. L., I.M.S., to Sept. 20, 1912.
Godkin, Major S. R., I.M.S.
Groube, Major G. P. T., I.M.S., 1 y., from Aug. 23, 1911.
Hebbert, Captain R. F., I.M.S., 19 m., from March 20, 1912.
Heron, Captain D., I.M.S., to June 9, 1912.
Horton, Captain J. H., I.M.S.
Hudson, Major C., D.S.O., I.M.S., 18 m., from January 1, 1912.
Johnston, Lieutenant-Colonel C. A., I.M.S.
Kerans, Captain G. C. L., I.M.S., 1 yr., from April 5, 1912.
Keyworth, Captain W. D., I.M.S.
Marr, Captain C. F., I.M.S., 1 yr., from March 22, 1912.
McNeill, Captain A. A. C., I.M.S.
Melville. Lieutenant-Colonel H. B., I.M.S.
Nicholson, Captain R. B., I.M.S., 12 m., from Dec. 30, 1911.
Price, Major R. H., I.M.S., 1 y., from Dec. 10, 1911.
Rennie, Captain P. M., I.M.S., 1 year from Jan. 10, 1912.
Riddell, Captain W. H., I.M.S.
Simpson, Captain W. J., I.M.S., 8 m., from March 21, 1912.
Smith, Captain F. F. S., I.M.S., 6 m. 26 d., from March 13, 1912.
Twigg, Major H. J. R., I.M.S.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"Lancet," February 3, 1912.

Salvarsan in the Treatment of Syphilis.—Foerster gives a good summary of the use of salvarsan in the treatment of syphilis in the above number of the *Lancet*. His experiences were gained at the London Lock Hospital, when resident medical officer under Mr. J. Ernest Lane, and his observations are worthy therefore of attention. He believes that the following maxims are useful in planning out a treatment by salvarsan: (1) Salvarsan is of special value where rapidity of action or concentration of treatment is desirable—e.g., for the removal of certain infective lesions, for patients whose conditions of life render a regular treatment impossible. (2) It is widely applicable, as its toxicity is small. Cardiac disease, syphilis of the nervous system, and concomitant grave maladies are its chief contra-indications. (3) The intravenous method is the only recommendable one. (4) Repeated medium doses are preferable to a few large ones. (5) Its use is indicated where mercury has failed. (6) In very early cases an attempt at aborting the disease by excising the chancre and administering salvarsan is advisable. (7) In florid secondary syphilis combined salvarsan and mercury treatment should be instituted and persevered with. (8) The severe tertiary cases should also be submitted to this combined treatment. (9) In mild tertiary cases salvarsan recommends itself by the rapidity of the removal of the lesions, and by the long duration of the subsequent latency. (10) Truly malignant cases are as hopeless under salvarsan treatment as otherwise. (11) In late latent cases and in parasyphilis the administration of salvarsan presents no utility.

"British Medical Journal," February 24, 1912.

Ruptured Spleen.—Clarke describes a case of ruptured spleen where splenectomy was performed, recovery taking place. The patient lived in England, and had apparently never been abroad, the cause of the injury being a fall from a hayrick.

Two blood examinations were made after the removal of the spleen, as follows (operation July 20, 1911):—

First Examination, July 28, 1911.

Red Cells.—Number 2,000,000 per c.mm. Rouleau formation fair. Some tendency to agglutination. Marked poikilocytosis. Macrocytes and microcytes present, and ghosts. Polychromatophilia. Granular and vacuolar degeneration marked. Normoblasts and megaloblasts present. Blood platelets numerous. Coagulation good.

White Cells.—Number 6,000 per c.mm., as follows:—

Polymorph. neutrophiles ...	212 = 70.3	per cent.
Small lymphocytes	28 = 9.3	,,
Large lymphocytes	29 = 9.6	,,
Large hyaline	16 = 5.3	,,
Eosinophile	14 = 4.6	,,
Mast cells	None seen	
Transitional leucocytes ...	1 = 0.3	,,

There were 13 normoblasts and 6 megaloblasts seen while counting 300 leucocytes.

Second Examination, August 19, 1911.

Red Cells.—Number 4,000,000 per c.mm. No nucleated red cells were seen. No granular or vacuolar degeneration. Poikilocytosis and polychromatophilia slight. Rouleau formation fair. Platelets normal. Macrocytes and microcytes still present.

White Cells.—Number 6,420 per c.mm., as follows:—

Polynuclear neutrophiles ...	143 = 47.6	per cent.
Small lymphocytes	80 = 26.6	,,
Large lymphocytes	37 = 12.3	,,
Large hyaline	16 = 5.3	,,
Eosinophiles	20 = 6.6	,,
Mast cells	4 = 1.3	,,

These figures correspond to what has been often found now as occurring after removal of the spleen.

"New York Medical Journal," March 23, 1912.

Multiple Infection with Helminths. — Rosenberger reports the case of a Russian labourer in whose fæces the eggs of *Ascaris lumbricoides*, *Fasciolopsis buski* and *Trichocephalus trichiurus* were present. In addition to these ova *Balantidium coli* was also found. Rosenberger discusses also the question of the presence of amœbæ in the stools of apparently healthy individuals.

"Journal of the Royal Army Medical Corps," vol. xviii, No. 4, April, 1912.

Bilharzial Disease.—Lieut.-Colonel Cottell makes a note on cases of *Bilharzia hæmatobia* collected at the Royal Hospital, Chelsea. The number of men invalided for this complaint up to the end of December, 1911, reached 626. Possibly, as Colonel Cottell thinks, many more cases may really have occurred, but because of the trivial nature of their symptoms the patients either have not noticed their condition or have not thought it worth troubling about.

Up to the present no drug has exerted any beneficial effect as regards the cure of the disease, and the cost to the State per annum for invalid pensions has of course been considerable.

"The Journal of the American Medical Association," vol. lviii, No. 14, April 6, 1912.

Tropical Medicine in the Philippines.—Chamberlain gives a summary of the work performed during the last two years by the United States Army Board in the Philippine Islands. Some very interesting researches have been conducted, notably on typhoid fever and beri-beri. In addition to these many miscellaneous observations have also been recorded. Amongst these may be mentioned: temperature observations to show the unsuitability for tropical wear of certain new uniform materials: tests to determine the fineness of mesh necessary in bronze gauze to exclude Philippine *Anophelinæ;* examinations to prove the wholesomeness of fresh beef and emergency rations which have been kept for many years in Manila, the former in cold storage; observations on the influence of the tropical climate on the weight and the body temperature of white men; the study of a fever of undetermined type, and of an epidemic of Koch-Weeks' bacillus conjunctivitis, both occurring on Corregidor Island; a report on the so-called "X-bodies," which have been thought by some to be parasites and which the Board has shown to be artefacts on glass slides; the finding of the *Bacillus influenzæ* in the Philippines; reports of cases of bronchial spirochætosis and pulmonary blastomycosis in the Philippines; and a discussion on yaws as a cause of chronic ulceration in the tropics.

"Kala-Azar Bulletin," vol. i, No. 2, 1912.

Kala-azar.—The above number of the Bulletin which is edited by Dr. Wenyon, Protozoologist to the London School of Tropical Medicine, contains the following papers. (1) Infantile kala-azar and its treatment. (2) A map of the Mediterranean Region showing distribution of kala-azar and Oriental sore. (3) Dermal Leishmaniasis in South America and Panama. (4) The blood in Oriental sore. (5) Treatment of Oriental sore. (6) Quarterly list of references. The first paper consists of an interesting and exhaustive *résumé* of the work done on infantile kala-azar since Cathoire in 1904 noticed in films, made from the spleen of a child in Tunis, a parasite similar to the *Leishman-Donovan* bodies found in kala-azar. Since that day an enormous amount of work has been done on the subject and the disease has been found to be a much more widespead one than was at first supposed. Dr. Wenyon's article gives a very good description of the subject and should be consulted by all workers in this branch of protozoology.

"The Journal of the American Medical Association," vol. lviii, No. 20, May 18, 1912.

Salvarsan in Pellagra.—Cranston reports a series of cases of pellagra treated at the Georgia State Sanatorium in 1911, salvarsan being one of the drugs tried. After a careful study of the subject, Cranston concludes that we have not, as yet, found a cure for pellagra. Salvarsan, however, he considers, has not been given a thorough trial yet, and it may be that some following spring will develop obscure points in the use of the drug that may bring more certain and permanent results from its employment.

"The Journal of the American Medical Association," vol. lviii, No. 20, May 18, 1912.

Hæmatoporphyrinuria.—Rogers reports a fatal case of hæmatoporphyrinuria following the prolonged use of trional and sulphonal. The patient was a chronic neurasthenic, and suffered from insomnia. He had taken the sulphonal over a considerable period of time before the symptoms of the disease appeared. These were marked gastric distress with almost continuous vomiting, continuous abdominal pain, particularly round the umbilicus, with tympanites, obstinate constipation, and the usual characteristic discoloration of the urine. Rogers comments upon the ease with which patients can procure such drugs, and the evident danger to themselves in taking them over long periods of time.

"Annals of Tropical Medicine and Parasitology," series T.M., vol. vi, No. 1, B, May 29, 1912.

The Treatment of Beri-beri.—Thomson and Simpson report on three cases of beri-beri treated by yeast and katjangidjo beans. The improvement in the condition of these patients was much more rapid than is customary, and would seem to show the marked curative power of the addition to the diets of Katjangidjo beans, as recommended by Hulshoff Pol, and of yeast, as recommended by Schaumann. The yeast was of the variety used by brewers, and was administered in rice papers, the patients being able to swallow, in this fashion, about 1 drachm at a time.

"Annals of Tropical Medicine and Parasitology," series T.M., vol. vi. No. 1, B, May 29, 1912.

The Cultivation of Trypanosoma rhodesiense.—Thomson reports the successful cultivation of *T. rhodesiense.* Success was attained, after many failures, by the use of a modification of the Novy-McNeal-Nicolle medium. In the water of condensation of this medium *T. rhodesiense* was successfully cultivated, for two weeks, by incubating at a temperature of 25° C. to 28° C., and subcultures of one generation continued to develop for eleven days, and then all flagellate forms disappeared. In this preliminary note Thomson gives, as concisely as possible, the changes which take place in the culture tubes. It was found that the cultures were most successful if young trypanosomes were inoculated into the tubes. By young trypanosomes are meant trypanosomes taken from an infected rat about the second day after their appearance in the peripheral blood.

In some of the culture tubes the development was rapid, and when such occurred the culture died out much more quickly, *i.e.*, in about seven days.

The modification of the Novy-McNeal-Nicolle medium used in the cultivation of *T. rhodesiense* consisted in substituting for defibrinated rabbit's blood citrated rat's blood heated to 45° C. for half an hour, and sea salt was substituted for ordinary sodium chloride.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

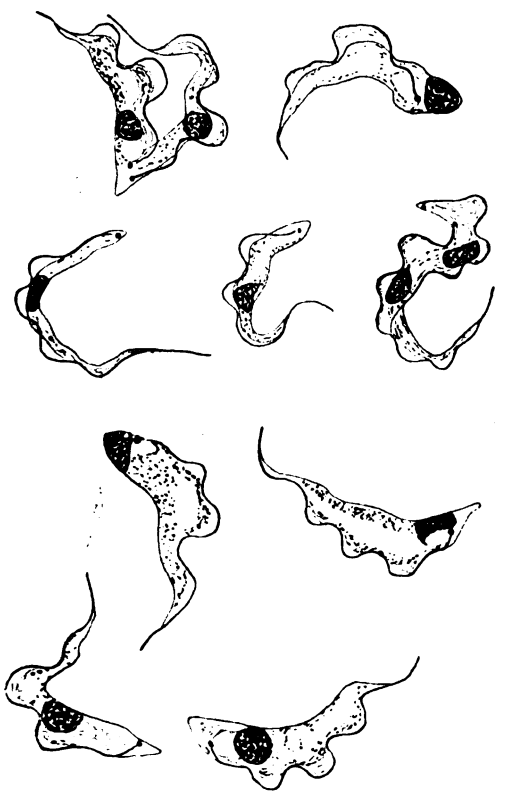
Original Communications.

THE INSUFFICIENCY OF THE POSTERIOR NUCLEUS AS A SPECIFIC DISTINCTION IN *TRYPANOSOMA RHODESIENSE*.

By C. M. Wenyon, M.B., B.S.

Protozoologist to the London School of Tropical Medicine.

I HAVE recently been re-examining films of rat blood containing *Trypanosoma pecaudi*, which were made by me in the Sudan in February, 1908. The original strain was obtained from a donkey which was infected in the Bahr-el-Ghazal, and the strain had been kept up in brown rats for some months. The figures of *T. rhodesiense* given by Stephens and Fantham reminded me of *T. pecaudi*, and on looking over the films I find that forms with the tropho-



Trypanosoma pecaudi in blood of rat × 2,000.

nucleus near to the kinetonucleus are fairly common, while a small percentage of these comparatively broad trypanosomes have the nucleus at the posterior end of the body, as in the rat strain of *T. rhodesiense*. In the light of the diagnostic importance of this nuclear arrangement in the case of *T. rhodesiense*, as emphasized by Stephens and Fantham, it seems to me worth while placing the present observations on record. In the case of *T. pecaudi*, the forms with the nucleus near the posterior end of the body occurred both in the blood of the inoculated rats and also in the original host—the donkey. In the latter animal, however, I have not found a form with the nucleus on the posterior side of the kinetonucleus, though probably a more prolonged search would reveal such, since many occur with the nucleus right up against the kinetonucleus. In the case of *T. rhodesiense*, the posterior nuclear forms occur only in the sub-inoculated rats, whereas in *T. pecaudi* they occur also in the donkey. This is probably dependent upon the infection, which is always very small in man, while it was large (5 to 10 trypanosomes per field 2 mm. Zeiss) in the donkey. In the case of both these trypanosomes, it is perhaps incorrect to talk of either man or the donkey as the true host. In both cases there is no sign of adaptation, for the infection nearly always brings about a fatal termination. The true host is rather the reservoir from which man and the donkey become infected. It is quite possible that one and the same trypanosome would show certain morphological variations in the same host, provided that in one district the host had become more adapted to its parasite than in the other. As far as I am aware the reservoir for *T. pecaudi* in the Sudan has not been discovered. It would be interesting to know whether this trypanosome ever appears as the posterior nuclear form in this host.

The accompanying drawings have been made from a film of *T. pecaudi* in the rat. The several forms are shown, and all are drawn to a magnification of 2,000 diameters. It is interesting to note that the comparatively broad forms with the posterior nucleus may divide, and give rise to a trypanosome of the ordinary type. Of 1,138 trypansomes counted, thirty-six showed the nucleus close to the kinetonucleus or only separated by a vacuole, and two had the nucleus on the posterior side of the kinetonucleus.

I am aware that it is maintained by some authorities that *T. pecaudi* is none other than *T. brucei*. If this be so, then the value of the nuclear arrangement in question as a distinguishing feature of specific importance is still further lessened.

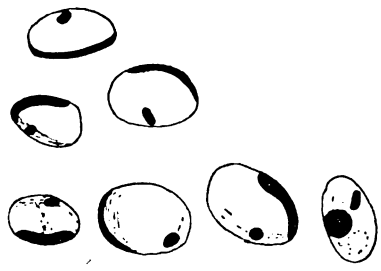
A SUPPOSED PECULIARITY IN THE STRUCTURE OF THE LEISHMANIA FROM SKIN LESIONS IN SOUTH AMERICA.

By C. M. Wenyon, M.B., B.S.

Protozoologist to the London School of Tropical Medicine.

In the *Bulletin de la Société de Pathologie Exotique*, for March of this year, Laveran and Nattan-Larrier record the discovery of Leishmania in films which had been made from the lesions of the disease known as espundia, of Peru and Bolivia. According to the authors the parasites are peculiar in that the large trophonucleus, instead of being a round body, is very much flattened out and is arranged as a kind of chromatin band along one side of the parasite. They say that in the films this appearance is constant, and that they were unable to find similar bodies in films made from Oriental sore of the East. I have recently been able to examine a case of dermal leish-

maniasis from Peru and Bolivia. The Leishmania from the sore corresponded in every way with those I have seen in the Bagdad sore. Many of the parasites show the flattening of the trophonucleus described by Laveran and Nattan-Larrier, but the majority have the typical Leishmania structure. That this flattened type of nucleus is not peculiar to the Leishmania from the South American sore will be seen from the accompanying drawings which have been made from films of a Bagdad sore. A comparison of these with the drawings of parasites from the South American sore, given by Laveran and Nattan-Larrier, will convince one of the similarity of the



Leishmania from a Bagdad Sore.

two. The parasites with the flattened nuclei are found both within the cells and free in the *débris* in the smear. It may be worth while stating here that I have obtained cultures of the South American Leishmania in N.N.N. medium, and that they show no differences from cultures I have previously made of the Bagdad strain. Further, a dog inoculated in the skin of each ear and on each side of the nose with virus from the sore developed a sore on each ear in which Leishmania were numerous, after an incubation of two months.

The Treatment of Amœbic Dysentery with Soluble Salts of Emetine.—Leonard Rogers, I.M.S., Professor of Pathology, Calcutta, in the *British Medical Journal*, June 22, 1912, describes a new method for treating amœbic dysentery and hepatitis. This, shortly, is by the hypodermic injections of soluble salts of emetine in place of the usual powdered ipecacuanha root by mouth. Vedder last year showed that emetine, the principal alkaloid of ipecacuanha, has the power in high dilutions of destroying amœbæ in broth cultures, and Rogers has now confirmed this by testing the effect of soluble emetine hydrochloride on *Entamœba histolytica* in dysenteric stools. On placing a piece of mucus, containing numerous active amœbæ, in normal saline solutions of the salts, Rogers found that the pathogenic organism was immediately killed and materially altered in its microscopical appearances by a 1 in 10,000 solution, while after a few minutes they were rendered inactive and apparently killed by as weak a solution as 1 in 100,000. Following this up, then, he determined to administer the emetine hypodermically in the treatment of amœbic disease, and the results in the few cases so far treated have been excellent. One of the most important of these results was the fact that the emetine given in this way caused no unpleasant effect on the patients, and did not produce vomiting even though in the same cases ipecacuanha given by the mouth had done so. The salt used by Major Rogers was *emetine hydrochloride*, and at first he gave this in doses of $\frac{1}{6}$ gr. (hypodermically), this being equal to 15 gr. of ipecacuanha. In the later cases $\frac{1}{3}$ gr. (equal to 30 gr. of ipecacuanha) and even $\frac{1}{2}$ gr. (equal to 45 gr. of ipecacuanha) were given without producing any ill effects on the patient, though their action on the disease was magical. *Emetine hydrobromide*, Rogers thinks, might also be given, but it is not quite so soluble as the hydrochloride. There is no doubt that this new method of treating amœbiasis will prove a very important one, because, as Rogers says, the drug can be given when the administration of ipecacuanha by the mouth is impracticable. It is sincerely to be hoped that further results will confirm Major Rogers's new method, and place it on a secure and firm basis.

The Health of the Canal Zone for April, 1912.—Dr. John L. Phillips, Acting Chief Sanitary Officer for the Isthmian Canal Commission, in his report on the department of sanitation for the month of April, 1912, states that the total number of deaths from all causes among employees was 48, divided as follows: Disease, 37, and violence, 11, giving the annual average per thousand of 8.77 and 2.61, respectively.

Among employees for the month of April of each year the annual average death-rate per thousand was as follows: 1905, 10.95; 1906, 30.00; 1907, 38.67; 1908, 7.77; 1909, 8.57; 1910, 13.04;; 1911, 9.38; 1912, 11.38.

The annual average death-rate per thousand in the cities of Panama, Colon, and the Canal Zone, including both employees and civil population, for the month of April of each year, was as follows: 1905, 39.29; 1906, 39.06; 1907, 40.97; 1908, 20.04; 1909, 16.77; 1910, 19.73; 1911, 17.74; 1912, 17.21.

In segregating according to race, the annual average death-rate per thousand from disease among employees was: For whites, 3.74, and for blacks, 10.48, giving a general average for disease of 8.77. For the same month during 1910 the annual average death-rate per thousand from disease among whites was 4.48, and blacks, 9.97, giving a general average of 8.62; and in 1911 from disease among whites, 2.85, and blacks, 7.67, giving a general average of 6.42.

Among employees during the month the deaths from the principal diseases were as follows: Chronic nephritis, 2; dysentery, clinical, 1; hæmoglobinuric fever, 1; malarial fever, E. A., 1; organic disease of the heart, 4; pneumonia, 4; tuberculosis, 9; and typhoid fever, 1, leaving 14 deaths from all other diseases, and 11 deaths from external violence.

No cases of yellow fever, small-pox, or plague originated on or were brought to the Isthmus during the month.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JULY 1, 1912.

AN IMPERIAL MEDICAL SERVICE.

THERE is a surmise that out of the chaos of the Insurance Act there may arise a State Medical Service for Great Britain. Concerning the advantages and disadvantages of such a Service much may be said, but that it might prove beneficial to the health of the nation, if properly organized and carried out, is probable. We have before us the examples of the Public Services of the Navy, Army, and the Crown Colonies and Protectorates, and it should not be difficult to evolve a Home Department Medical Service to be dealt with on lines similar to those already in existence.

We have not yet developed our Public Services to the full. The Army Medical Service affords us the best model, but until the departments are specialized into clinical, administrative, and sanitary, it cannot be regarded as having attained the ideal of organization. The Naval Medical Service requires to be put on the same footing as the Military, and not until there is founded a R.N.M.C. (Royal Naval Medical Corps) on the same model and with the same position of officers to men as in the R.A.M.C. (Royal Army Medical Corps) will the Naval Medical Service attain the position it is entitled to.

The Colonial Medical Service is being gradually brought into line, but it will be long before a R.C.M.C. (Royal Colonial Medical Corps) sees the light, unless some strong man takes the matter up and deals with it systematically.

For these Services there ought to be a common channel of entrance. In the meantime there is a competitive examination for entrance into the Army and the Navy Medical Services; but to the Colonial Service men are "nominated"; a plan of selection which has something in its favour, but as it is not in harmony with the other public Services is apt to cause it to be looked at askance by those in the more highly organized Services. The difficulties of selecting candidates by examination for the Colonial Medical Service have been exaggerated. Mauritius seems to be the one stumbling-block to this being carried out, inasmuch as the staff are mostly composed of French medical officers who cannot be expected, it is said, to come from Mauritius to England for examination before being appointed. All these French officers, however, have to qualify in France, and it is but a step across the Channel to London. In the Indian Medical Service the Indian students have to come to England to compete for posts in that Service, a much greater tax in time and money than a journey from Paris to London. However, leaving the French section out of the question, the posts open to men holding British qualifications in the service of the Mauritius Government could take their place at any competitive entrance examination that might be established. In the Medical Services, as for the higher Civil Service appointments, there should be one channel of entrance. In the Civil Service examinations, held once a year, three departments are dealt with, viz., the Home, the Indian, and the Colonial Services. A candidate puts his name down for one, for two, or for all three of the departments in which he is willing to serve, and according to the position he takes so is he allowed to select. We ought to have the same system for the public Medical Services—the Army (Home and Indian Services should be blended), the Navy and the Colonial Service, and it is only by the mere addition of a name—the Home Medical Service, should that be formed—that a complete Imperial Service would be brought into being.

That this will come about for the public Medical Services already in existence there is no doubt; it only wants an organizer of courage to bring it about, and we are not surely so degenerate as to believe that such a man will not arise amongst us. The benefit to the Naval Medical Service would at once appear; a medical officer of His Majesty's Navy would be no longer a "ship's doctor," as he is too apt to be regarded in that Service; he would belong to a corps—the R.N.M.C.—with the men of his corps under his actual command, as the men in the R.A.M.C. are under their officers; they would wear a distinctive

uniform as in the Army, and obtain real instead of merely relative or honorary rank as at present. The men of the corps would no longer be designated "sick bay attendants," or some such nonsensical or derogatory title, but would belong to the R.N.M.C., responsible to the medical officer under whom they serve in a real sense.

The Colonial Medical Service in the same fashion should be organized on a satisfactory footing, and elevated to a position which the great responsibilities the medical officers of this Service have to undertake justly entitles them to. It is said different conditions as to amount of work, nature of work, and to regulations of pension prevent this consummation being reached; these obstacles are not insurmountable, and can be overcome if seriously taken up; but even with these obstacles existing they do not prevent entrance by a single channel being substituted and the successful candidate left to select where he will serve or take what is left to him if so minded by his position in the competition.

There are State (and Municipal) Home Appointments in Great Britain at present—Medical Officers of Health, Poor Law Appointments, State Asylums and Prisons—which it would be well to bring into line with the other public Services; and were a further number of Medical Officers brought into the service of the State by the Insurance Act, they could be incorporated in the Home Medical Service and apportioned as are the candidates in the Home, Indian and Colonial sections in the Civil Service examinations at which the best men of our Universities are brought into competition. For the Medical, as for the Civil Services, there would come forward the best men of our schools, and we would have an Imperial Medical Service of which the nation would be as justly proud as it is of the Home, Indian and Colonial civil servants, who, by their capacity, their administrative and judicial abilities, have rendered the government of the Empire possible and efficient.

J. CANTLIE.

Annotation.

Recent Contributions by the United States Public Health and Marine Hospital Service to Preventive Medicine.—Dr. Anderson, Director of the Hygienic Laboratory United States Public Health and Marine Hospital Service, Washington, D.C., contributes a very interesting paper to the *Journal of the American Medical Association* (June 8, 1912) on some of the recent work done in preventive medicine by the service to which he belongs. The work has been conducted along two main lines, viz., research work in the laboratories and the application of methods in the control of disease. Measures were instituted, for example, for the control of cholera, these being considered under three main heads:—

(1) Quarantine Measures Enforced at Foreign Ports.—These consisted in the enforcement, by officers of the service at foreign infected ports, of a detention of all steerage passengers for five days before embarkation from cholera-infected places and the observation of those detained during that time. The disinfection of baggage was required and the bringing of foodstuffs by immigrants was prohibited. The Italian Government put into effect, for a time, in addition to the measures enforced by the United States officers, the examination of detained immigrants to detect cholera bacillus-carriers, and by this measure alone forty-one carriers were discovered and prevented from sailing from Italian ports.

(2) Quarantine Measures Enforced during the Voyage.—These consisted in the enforcement of the measures provided for in the United States quarantine regulations in regard to ships from infected ports.

(3) Measures Enforced at Ports of Arrival in the United States.—These included, in addition to those procedures already provided for in the quarantine regulations, the adoption and enforcement of certain special measures. July 19, 1911, the following amendment to the national quarantine regulations was issued by the Secretary of the Treasury on recommendation of the Surgeon-General of the Public Health and Marine Hospital Service: "All steerage passengers arriving at ports in the United States from ports or places infected with cholera shall be subjected to bacteriologic examination and shall not be admitted to entry until it has been determined by said examination that they are not cholera bacillus-carriers."

Under authority of the United States quarantine laws officers were detained as inspectors at the local quarantines at New York, Boston and Providence to see that this measure was immediately put into effect, these ports being the only ones having direct Italian immigration.

In addition, two officers from the Hygienic Laboratory, especially trained in the bacteriological diagnosis of cholera, were sent to the New York quarantine station to aid the local authorities in the large number of bacteriological examinations made necessary by the adoption of the amendment to the regulations just referred to, and an officer was also on duty at Boston and Providence for the same purpose.

Another measure of importance was the adoption of the immigration destination-notification system. This measure provided that, when immigrants arrived at United States ports from cholera-infected places, the health officers at the places of destination should be sent notification cards informing them that immigrants from such-and-such places arriving on such-and-such ships are *en route* to their cities. In this way the local health officers may have oversight of immigrants from infected ports during, at least, the incubation period.

In co-operation with State and local health authorities, about 34,000 specimens of bowel discharges from passengers and crews from cholera-infected ports were examined bacteriologically to detect cases of cholera or cholera bacillus-carriers. As a result, at the New York quarantine station, the cholera vibrio was isolated from twenty-eight persons sick with the disease, and twenty-seven healthy persons were found to be discharging the cholera vibrio in their fæces. These latter could not have been discovered except by the

laboratory examination required by the amendment of July 19, 1911, to the quarantine regulations. Seven cases of cholera were detected at other places by the same methods. There can be no doubt but that the adoption of this measure alone by the federal health service saved the people of the United States from the loss of life and expense attendant on a serious epidemic of cholera. So far as known, the anti-cholera measures of the past summer were the most extensive ever undertaken, based on the scientific knowledge of the dissemination of the disease by carriers and on the principle that after a person liable to convey infection has been shown by laboratory examination to be free from infection there should be no bar to his entrance to the country. This great work, Dr. Anderson says, was carried on quietly and without publicity, and the country did not know of the danger that threatened it, and from which it was saved by the Public Health Service.

Measures were also adopted for the suppression of bubonic plague in San Francisco, and these conclusively proved that it was possible to eradicate this disease even when it had obtained a foothold in a large city. No plague, either in human beings or in rats, has been found in San Francisco since 1908. Work inaugurated under Dr. Blue to establish a plague-free zone to protect the bay cities has made such progress that the disease has been eradicated from four counties, the area of squirrel infection defined, the possible routes of infection to Eastern States determined and guarded against, and a constant warfare against rodents continued.

In connection with the field work against plague, a large amount of research work on the disease was made in the plague laboratories. During the past four years 1,171,721 rodents were examined to detect plague infection. A plague-like disease of rodents easily confused with plague by persons inexperienced in the diagnosis of the latter disease was found, its cause discovered and the susceptibility of certain of the lower animals to plague determined.

In addition to these two very important pieces of work, work on typhoid and pellagra were also carried out, and measles, typhus and Brill's disease were in addition carefully studied.

As a result Dr. Anderson is now able to state that typhus of a mild type has been present in New York City for a number of years, and there is good reason to believe, he thinks, that the same is true of other large American cities. The recognition of these comparatively mild forms of typhus gives for the first time a rational explanation of what Osler has characterized as a "remarkable feature" of typhus, namely, the occurrence of a few cases at long intervals of time from any other outbreaks, and any known foci of the disease. In other words, these mild forms constitute the missing epidemiological link between so-called sporadic cases and outbreaks. This work, proving that typhus fever is present and has existed for years, unrecognized as such, in the United States, is one of the most important recent developments in preventive medicine. It opens up a fruitful field, the cultivation of which devolves primarily on the medical profession and local health authorities. The recognition and reporting of cases is an essential factor in the control of the disease, and great credit is due to Dr. Brill, who first recognized the disease and differentiated it from typhoid and continued to study and report it for thirteen years.

These extracts from Dr. Anderson's most interesting paper show what valuable work his service has carried out and is carrying out now. Their reports which are published from time to time are well worthy of the most careful study, and may well be taken as models for work in other parts of the world.

Abstracts.

A CRITICISM OF THE RESULTS OF ENGLISH WORKERS ON THE SO-CALLED HETEROGONY IN ANKYLOSTOMA.*

By Professor A. Looss.

(*Continued from p.* 185.)

Up to this point, the author is satisfied with the results of his experiments. "There are the ankylostomal fæces and there are the breeding forms, &c. But after all it is only a *post hoc* assumption that the organisms described really come from the ankylostomes. The reader must have noticed the curious fact that though the embryos in water lived happily enough, they did not take on parental functions; also that the fæces which produced the breeding forms had been exposed to the air. To prove the case it is necessary to obtain the free form from the uncontaminated ovum of the adult parasite." This idea is carried out: "Ova were placed on agar in a petri dish. The dish, wrapped up in cotton wool and linen cloths, was kept in a close box in an atmosphere of naphthalein. Some embryos appeared in the course of twenty-four hours, others appeared from time to time, but no breeding took place, and the embryos did not develop sexual markings. I am brought to the ground again." The same result was yielded by a number of further experiments with fæces containing eggs, while "control preparations infected with breeding forms flourished when packed away as described above."

Finally, the author happens to find a small fly (identified later as belonging to the genus *Stethopathus Wandollek*) and sees in it the "host" of the worm with which he is working. Experiments showed that this fly can carry the "embryos" of the breeding organism to nutritive media as yet not infected; in this way the old culture mentioned above had been infected with these organisms. When the fly was dissected, young worms were found in its body; they were also found in the larvæ and pupæ of the fly, not, however, in its eggs. Smith conjectures that the parasites enter the maggots through the skin and again pass out of the fly through its skin. The fly, however, does not play any necessary part in the life of the worms, for Smith proved by other experiments

* Being an Abstract from the "Records of the School of Medicine," Cairo, vol. iv.

that the latter multiply in agar, &c., without its intervention. It was also established that undoubted ankylostoma "embryos" picked up by the larvæ of the fly were later found alive in the pupæ and developed insects. The worms did not breed during their sojourn in the insect.

Besides cultivating the "embryos" under various conditions, Smith made a great number of feeding experiments, some with dogs and some with monkeys. I shall not attempt any enumeration or discussion of these experiments, since their results, which were partly positive and partly negative and which often surprised the author, may be sufficiently explained by what has already been said on the subject. The conclusion arrived at by the author himself is not very encouraging: "On the whole, the evidence as to the connection of the free-living organism with the ankylostomum is weak—the positive results are not very positive, and there are three pronounced negative results in the attempts to infect *viâ* the skin, and one by the mouth." In fact, the author, notwithstanding all the trouble taken, which every reader of his work must acknowledge, was not able to gain any clear idea of what had actually been achieved; the real and natural connection between all the different facts observed was not found. Since, however, all these facts were natural occurrences, they must naturally hang together and be explicable in some simple way. That this is really the case I shall now try to show. The task is not, on the whole, an easy one, in the first place because the author, except in the most obvious points, gives no data as to the structure of the organisms observed by him, and secondly, because his designations of the various stages are not so distinct one from the other as to enable the reader always to recognize with certainty what he means.

I begin with a fact which is quite clear from Smith's statements, and this is that whenever the eggs to be cultivated were taken direct out of the body of the parental worms, and their identity as ankylostoma eggs was thus indisputably proven, "breeding forms" never developed: the "embryos" remained asexual. This fact agrees fully with what has been established with regard to the development of the true *A. duodenale* and its relatives, and, had it been rated at its right value, would perhaps have put Smith on the right way. In some other experiments eggs contained in the fæces of human beings and of dogs were cultivated and again yielded only asexual larvæ; this proves that in the respective fæces ankylostoma eggs alone, and without any foreign admixture, were contained.

The "breeding forms," unlike the asexual genuine ankylostoma larvæ, were in all cases cultivated from fæces, never from eggs taken out of the worms. According to what has been said above, free-living, sexual stages occur both in the various species of *Strongyloides* and in free-living nematodes. The most easily recognizable difference between the two is that the "breeding forms" of *Strongyloides* appear only in one generation and then do not multiply further, while among free-living nematodes, given a sufficient supply of nourishment, new generations continually follow one upon the other, and the worms constantly increase in number. When this difference is taken into consideration, it becomes certain that Smith had to do with free-living nematodes in all those cases, where he records that the breeding forms "flourished" or "bred freely." Their behaviour in milk (which became sour) and on beef (which became putrid) at once recalls the species of rhabditidæ which live in decaying organic matter and there multiply freely. The question whether Smith worked with one or more species of such free-living nematodes is difficult to decide. Probably the latter was the case; at least I am inclined to interpret the author's allusion to changes of shape in the caudal region of the "organisms" in this way. Smith himself regards these changes as the outcome of the influence of external conditions, especially of an increased or diminished supply of food. It ought to be remembered in this connection that, according to Oerley, the food conditions (quantity and quality of the food) actually exercise a distinct influence on the length of the worms; indeed, the mature ankylostoma larva also varies noticeably in length according to whether it is well or sparingly fed during its growth. The length, and especially the shape of the tail, are, on the other hand, very constant and yield the most important distinctive characters for the species. Since Smith alludes to variations, it is probable that he actually had to do with several pieces of free-living nematodes.

After what has thus far been said, there can be no doubt that Smith worked with genuine ankylostomes (whether these were *A. caninum* of the dog, *Necator americanus* of apes and man, *N. africanus* of monkeys, or *A. duodenale* cannot be said) and with several species of free-living nematodes. With regard to *Strongyloides*, it is not certain, but still extremely probable, that one species of this genus also played a part in his researches. Thus, in his first experiment, in which asexual larvæ and a few breeding forms were derived from the fæces of dogs, I feel inclined to identify these latter with *Strongyloides*. It is, at any rate, remarkable that the author should speak of the breeding forms producing "embryos," but should not say that these latter developed once more into breeding forms. Another reason for concluding that a species of *Strongyloides* must occur in dogs in Sierra Leone is yielded by the author's remark that "a pup obtained for experiment was in the habit of devouring its own fæces, which contained many ova. The pup passed hundreds of living embryos per rectum—yet there were very few adult forms in the intestine." Smith is inclined to connect this observation with self-infection; I cannot, however, make out clearly from his statements how this could have been brought about. For fresh fæces, if devoured, cannot lead to infection either with ankylostoma or *Strongyloides*. The appearance of "living embryos" in the fæces is, on the other hand, very characteristic of *Strongyloides*, and, according to our present experience, cannot be referred to any other parasite. The living larvæ have, naturally, nothing to do with the few

ankylostomes present in the intestine—presupposing, of course, that they were really present in the fresh fæces.

The "travellers" so carefully observed by Smith deserve special mention. We know that the larvæ of the various species of *Agchylostoma* and the filariform larvæ of *Strongyloides* undertake migrations after attaining maturity; protrusion above the surface of the cultures and the formation of polyp-like or petal-shaped agglomerates has even thus far only been observed in these two genera. With regard to migration, it has long been known that free-living nematodes also at certain times unite in masses and carry out migrations in common, and in doing so assume a shape exceedingly similar to that of the ankylostoma larvæ. Under these circumstances it is not at all impossible, but very probable, that among the "travellers" observed by Smith there were also such of free-living nematodes. In that case, the "travellers" of his experiments consisted of larvæ belonging to at least three different species and even members of different genera.

It is unfortunately impossible to tell from the statements of the author which of these species were concerned in the individual experiments. It is most probable that the material used was mixed, sometimes perhaps of only two species, oftener, however, of all three (or even more), while in the mixtures themselves sometimes the one species, sometimes the other preponderated numerically to a greater or lesser degree. If we bear this in mind we shall understand, first, that the "travellers" in some cases multiplied freely, in others remained asexual; and, further, that the feeding experiments made with them necessarily yielded altogether different results, especially when only ankylostoma worms were looked for later in the bodies of the animals so fed. For it is clear that a certain material used for infection, if composed of, *e.g.*, 80 per cent. *Strongyloides* (or free-living nematode) travellers and 20 per cent. ankylostoma-travellers could, even under the most favourable conditions, only yield a comparatively small number of mature ankylostoma worms, while an apparently identical material, which, however, contained 80 per cent. ankylostoma and 20 per cent. *Strongyloides*, &c., would give a result that would seem much more satisfactory; always supposing, of course, that the animal experimented on was suited for harbouring the ankylostoma species with which the observer was working. Negative results possibly due to an oversight in this respect have already been alluded to above.

Smith's failure to notice that the "travellers" were composed of different species was the cause of his obtaining such contradictory and incomprehensible results from his infection experiments; for it is self-evident that *Strongyloides* larvæ, &c., do not develop in the intestine into ankylostoma worms. Perhaps Smith would have come upon the track of the actual state of things if the mature *Strongyloides* were not so small and delicate as to need special attention for their discovery. It is in apparent contradiction to this explanation that he remarks in another place that "*Strongyloides intestinalis*" is common in man and monkeys in Sierra Leone, and that he also describes its presumable "breeding form" he had several times observed in the fæces of human beings. This breeding form is according to him distinguished from others by certain characters, the most striking of which is a "longitudinal striation." Unfortunately, this striation as well as the other characters mentioned by Smith are of little scientific use, and the accompanying sketches give the reader no supplementary information. The longitudinal striation would recall *Diplogaster liratus*, but the long whip-like tail of this species is not indicated in Smith's sketch. I think I shall not err in assuming that these "breeding-forms" were free-living nematodes which had accidentally passed into the fæces used for cultivation. The free-living generation of *Strongyloides* was, in any case, not recognized as such by Smith. The same is doubtless the case with regard to the parasitic generation of this species, for the author makes a very peculiar statement about the male: "The adult male parasite is said by Manson and others to be unknown. Scheube repeats the idea that the worm is hermaphroditic. I was lucky enough to find the male worm in the monkey, two only among crowds of females. I am informed, however, by a letter . . . that the male of this parasite in man was described and figured so long ago as 1881 by Perroncito." There is some confusion here. The male, described by Perroncito and referred to above, is not the male of the parasitic but of the free-living ("breeding") generation: the same, therefore, which had been seen, though not recognized, often enough by Smith in his own cultures. The parasitic generation, on the other hand, is known to exclusively exhibit the female shape. One thing, therefore, is absolutely certain, viz., that the males observed by Smith in a monkey did not belong to the genus *Strongyloides*.

A few more words, finally, as to the fly which, according to Smith, represents the "host" of the worm. Smith himself has proved that this fly does not play any essential, *i.e.*, necessary, part in the life of the "organisms," and he was equally unable to observe that reproduction or any kind of growth took place in the parasite while within the fly. Under these circumstances, it is hardly admissible to describe the fly as a "host" in the usual sense of that term. It simply functions, as Smith himself rightly recognised, as a disseminator of the worms, transporting these from infected spots to others not as yet infected. In further agreement with this is the fact that not only all the "embryos" of the different species cultivated by Smith were indiscriminately taken up by the fly, but that flies also, other than the species of *Stethopathus* known as the "grey fly," served in the same way as carriers of the worms.

If we now compare this state of things as it presents itself to the eye of the helminthological specialist, with the impression gained by Major Smith from the actual results of his studies, we shall have to admit that the whole matter has become decidedly clearer and more comprehensible. I will not maintain that by my interpretation all the apparent contradictions have been cleared up; but I have had to rely only on the fortunately "lengthy" and yet, as we

have seen, in some respects still insufficient accounts of Major Smith. Had I had the opportunity of being present at the experiments, or even of examining well-preserved specimens of the various "organisms," "breeding forms," "travellers," "asexual stages," &c., all the contradictions, I am bold enough to assert, would have been capable of explanation. The reason why Smith did not find the right solution to his problems is the same as in the case of earlier authors: insufficient distinction between the worms and, in its place, too great confidence in the methods of investigation used.

In connection with a lecture on ankylostomiasis given by Boycott to the Epidemiological Society of London (1905), in which the alleged heterogony of the parasite is not mentioned, a discussion took place, in the course of which Sir Patrick Manson pointed out as a "gap" that "Dr. Boycott takes no notice of the views of Giles and other observers, who believe that the ankylostoma is capable of reproducing outside the human body as well as inside the human body . . ." The question touched upon by Manson was taken up by Low: "Sir Patrick Manson has raised one very interesting point, not mentioned by Dr. Boycott; the rhabditic or sexual stage of the ankylostome outside the body, observed and described by Giles and others. This, I think, is an important fact in the life-history; and I remember Dr. Ozzard, when I was in British Guiana, being very emphatic about such a thing taking place . . ." To these remarks Boycott replies with the following statements: "With regard to developing outside the body . . . I am, personally, thoroughly convinced that there is no sexual development outside the body, and for two reasons: (1) I have entirely failed to observe such a development myself; and I have taken a great deal of pains to try to notice such a development by feeding larvæ on extracts of intestine and blood, and by keeping them in anaerobic conditions, and all the rest of it; (2) My attention has been strongly drawn to the fallacy that underlies all these experiments outside the body, and that is this: all over the world, and in practically every soil, are nematode worms which, so far as their larvæ are concerned, are practically indistinguishable from ankylostoma. If you keep these earth nematodes warm, in a few days they develop into sexual forms, which are exactly the forms which Giles originally described and figured, and they have the ordinary sexual apparatus which is common to nematodes. What people imagine to be a sexual stage of ankylostoma is really an earth nematode. It is remarkable how many of them there are which are practically indistinguishable from ankylostoma. . . . The fact is, there are worms which are doing their best to pretend that they are ankylostoma, and so mislead people. Other observers have also been misled by them. The worms which have been described in some papers in the last three numbers of the *Royal Army Medical Corps Journal* are clearly ordinary earth nematodes. Major Smith concludes that they do not represent the sexual stage of ankylostoma."

We have seen above that the errors of Giles and his followers are not quite so simply explained as Boycott here assumes, also that it is not exactly true that the various larval forms are practically indistinguishable from ankylostoma; in the whole purport of his reply, and in his assertion that no free sexual generation occurs in ankylostoma, Boycott is, on the other hand, perfectly right.

In a work published in 1906, E. François says: "Without being able to assert anything with regard to this, we have some reasons for believing in the unlimited reproduction of the worm in the form of larvæ in subterranean galleries . . ." and he adds, later on: "There is even cause for asking, we think, whether the *Rhabditis niellyi* and the *R. pellio* (Railliet) may not be two aspects or two stages of the ankylostoma. In this case the opinion of Sandwith and Giles, who believe in the complete maturation of the worm outside the human organism, would be verified." These utterances are only conjectures on the part of the author, but they show that the doctrine of the existence of heterogony in the ankylostoma still continues to find new adherents. It may be briefly mentioned in this connection that Calmette and Breton (to whom François refers), although they were unable themselves to observe any heterogony, give illustrations in the same work of unmistakable rhabditidæ as stages in the development of the ankylostoma.

It is much to be desired that the legend of the heterogony of the ankylostomes should at last definitively disappear from scientific literature. In the new edition of Daniels' "Studies in Laboratory Work" (1907) which recently came to hand, I am glad to find the paragraph about which Major F. Smith complained replaced by one more correct. The latest edition of Sir Patrick Manson's "Tropical Diseases" (1907) only contains the statement that "the observations of Giles are supported by Ozzard, Annett, Ross and Sandwith, but are opposed by Looss."

The above was written in the early months of 1908. Since then the question as to the existence or non-existence of a heterogony in the ankylostoma has again cropped up in connection with a paper on ankylostomiasis read by Sir Thomas Oliver before the Society of Tropical Medicine and Hygiene in February, 1910. The author himself said: "Although we have made many attempts, by feeding and otherwise, we have never had any evidence of the transformation of larvæ into the adult worm outside the body, but as the larvæ have their sexual character stamped upon them, and there are often other nematodes present along with ankylostoma larvæ in the intestine, some of which develop ova under observation, and which, when shed, give rise to larval forms of minute size, most of which die prematurely, it is an open question whether ankylostoma larvæ may not, under certain circumstances, possess the same powers as those other nematodes and thus perpetuate themselves in the mines. Like Dr. R. T. Leiper, I am of the opinion that we should be careful in coming to a conclusion in regard to the heterogenesis of *A. duodenale*. Notwithstanding what I have said

of the longevity of the larvæ, myriads of larvæ must be constantly dying in a mine, so that in process of time, if there is no infection, that particular mine should be clear; but, if it is possible for the larval forms to perpetuate themselves, the purification of a mine becomes a tedious and expensive undertaking." The subject is taken up in a discussion by Sandwith who remarks: "It was thought a few years ago that the ankylostomum was heterogenetic, and certain proofs were brought forward by Colonel Giles, I.M.S., in Assam, and by him (Dr. Sandwith) in Egypt. When Professor Looss came to Egypt he (Dr. Sandwith) showed him some specimens and drawings he had made and Professor Looss said he believed they were the result of a mixed infection and asked where the larvæ had been grown, and he (Dr. Sandwith) told him they had been grown in earth taken from the garden of the hospital. But if those things would grow in garden earth they ought also to grow in sterilized charcoal in the laboratory; yet they did not." In reply to this, I can only repeat what has been said on the preceding pages, namely, that from the exact biological standpoint—and the question of the development of the ankylostoma is in the first place a biological question—neither the experiments of Giles, nor those of Sandwith (and all the other writers) are proofs of the theory they were meant to support; they cannot be, for the simple reason that the authors in question never thought of establishing on anatomical grounds the true nature of the larvæ they dealt with.

HEALTH OF EUROPEANS IN WEST AFRICA.*

By Arthur E. Horn, M.D., B.Sc.Lond.
(Medical Officer, West African Medical Staff.)

In the *Lancet* of May 18, 1912, Dr. Horn states that the vital statistics of non-native officials in West Africa for 1911 afford very interesting reading and contain matter worthy of close attention. The statistics are drawn up in accordance with strict actuarial methods, showing, respectively, the age distribution of European officials in the Government service at the beginning of 1911, the deaths in and invaliding from each of the five British West African Dependencies, the rates per 1,000 of deaths and invalidings at various ages, particulars of officials who left the service during the year, and a summary of returns for the last nine years, from 1903 to 1911.

Death-rates.

In 1911 the total death-rate was 13.9 per 1,000, a decrease of 6.5 from that of the previous year; excluding five deaths due to causes other than disease, the rate per 1,000 was 11.7, or a decrease of 5.0 from the corresponding rate for 1910.

The considerable fall in the death-rate for 1911 must be regarded as very satisfactory, especially in view of the fact that during the year there were serious outbreaks of yellow fever in the Gold Coast and the Gambia. These outbreaks accounted for the deaths of thirteen non-native unofficials in the two Colonies, in addition to the four deaths of officials included in the returns.

The causes of deaths during the year 1911 were as follows: three blackwater fever, four blackwater fever and heart failure, one subtertian malaria fever of cerebral type causing meningitis, one malaria and cardiac asthenia due to fatty degeneration of the heart, four yellow fever, one liver abscess, one dysentery and hepatic abscess (operation), one acute hepatitis and syncope, one cirrhosis and cardiac failure, one iliac abscess and peritonitis, one valvular heart disease, one dilatation of heart and valvular disease with aortic dilatation, one nephritis, one aneurysm of arch of aorta, one acute pneumonia, one acute pneumonia and meningitis, one pulmonary tuberculosis, one erysipelas of head and hyperpyrexia, one œdema of glottis, asphyxia, and heart failure, one accident, one blasting accident (explosion), one gunshot accident, one killed by natives, and one accidentally drowned. Twenty-two deaths occurred in West Africa, eight in this country, and two at sea.

In addition to the deaths included in the returns there was one death amongst the "construction" officials, numbering approximately sixty-seven, employed in the Gold Coast. The cause was acute yellow atrophy of the liver and exhaustion. There was also one death from blackwater fever at Jebba in Northern Nigeria amongst the railway construction staff employed on the Lagos Railway Northern Extension. The number of officials employed on this extension during the year was approximately eighty-one.

Invaliding Rate.

As compared with 1910, there was a further decrease in the invaliding rate for 1911 of 7.3 per 1,000. It should be observed that although the number pensioned on account of ill-health during this year (twenty-eight, against fifteen in 1910) has very nearly doubled, yet the proportion of these to the total has not materially altered. It may be mentioned here, as supporting the view that a man quickly recovers from the effects of the West African climate, that officials invalided from the service are not infrequently found fit for re-employment after residence of a year or so in this country. Also officials pensioned generally enjoy their pensions for many years; in one or two cases the period on pension has been as much as forty years.

Under "invalidings" are included not only officials who were invalided home before completing their tours of service and whose appointments were terminated, but also all officials who, though they completed their tours, did not return to West Africa for health reasons, and also West African Frontier Force officers and non-commissioned officers who were unable, on account of ill-health, to rejoin their

*From the *Lancet*, May 18, 1912.

regiments at the expiration of their vacation leave. In practically every case the official had less than seven years' service. Pensioned officers are not included.

In reckoning the length of service of an official the periods spent on the voyage to and from West Africa and during leave in this country are included. The actual period of residence in West Africa may be reckoned, roughly, as ranging from two-thirds to four-fifths of the total service.

Of the officials who left the service during 1911 about 18 per cent. left owing to the expiration of their agreements or the completion of the work for which they were engaged, and about 7 per cent. at the expiration of the five years for which they were seconded by the War Office.

Taking the years from 1903 to 1911 the number of deaths was 312, of which forty-one were due to causes other than disease. The total death-rate for the period works out at 19.9 per 1,000 and the rate due to disease only, climatic and non-climatic, as 17.3 per 1,000. The rates corresponding to the latter rate were 19.3 for the period 1903-1908, 18.6 for the period 1903-1909, and 18.3 for the period 1903-1910.

In comparing the death-rates of the extreme years of this period it is seen that, whereas in 1903 with 1,259 European officials there was a death-rate of 20.6 per 1,000, the rate has fallen to 13.9 per 1,000 in 1911, when the number of officials has nearly doubled; while, at the same time, the average length of service of the deceased officers has increased from less than two years to over four years and a half. Similarly, the total invaliding rate, which was over 60 per 1,000 in 1903, has fallen to just over 25 per 1,000 in 1911, while the average length of service of officers invalided has increased from two years in 1903 to three years and a third in 1911.

The death-rate of 13.9 per 1,000 is the lowest that has hitherto obtained in British West Africa. Previous statistics, covering the period of seventeen years—from 1881 to 1897 inclusive—show that 554 European officials employed in the Gold Coast produced a death-rate of 75.8 per 1,000 per annum; and of 258 employed in Lagos the death-rate was 53.6 per 1,000 per annum, figures which justified the sad reputation of West Africa as the "white man's grave."

Results of Discoveries in Tropical Hygiene.

The wonderful improvement that has been effected since those times must be ascribed to the practical application of the modern discoveries of tropical medicine and hygiene. Credit for the application of the recognized principles of tropical medicine and sanitation is due to the Colonial Office and to the local administrations of these colonies and protectorates who have consistently authorized and approved expenditure on sanitation—such as the draining of marshes, "anti-mosquito" campaigns, the demolition of insanitary areas, the reconstruction of native towns and stations, and the control of water supplies, &c., with the intention of improving the conditions of life, not only for non-official and official Europeans, but for the African natives also.

No similar statistics are published concerning the invaliding and death-rates of non-official Europeans, including, for instance, merchants, miners, and missionaries; but a study of the Annual Medical Reports of the Colonies shows that the fall in these rates, although present, is less marked than in the case of officials. That this is unfortunately the case is due to circumstances over which the Government has little or no control. For instance, a reasonable segregation from collections of native inhabitants can be obtained for the dwellings of officials, whereas the trader commonly resides and sleeps over his store, more or less surrounded by natives, while the missionary also remains in constant touch with his flock. It is an undoubted fact that this absence of segregation is an important factor in the illnesses and mortality of such non-officials and, with the increasing importance and development of West African industries, such as gold-mining, tin-mining, and the cultivation and export of palm-oil, rubber, cocoa, &c., it cannot be too strongly impressed on African merchants and firms who send their representatives to live "on the Coast" that it is their duty, as well as to their advantage, to do all in their power to ensure at least that their employees shall sleep in buildings outside the native towns.

West African Medical Staff.

Finally, Dr. Horn thinks that some credit for the improvement he has described is due to the service to which he belongs—the West African Medical Staff. This service was formed in 1902 by the amalgamation of the medical departments of the various West African administrations, and then consisted of about 110 men. In 1908 a Departmental Committee was appointed by the Secretary of State for the Colonies to consider the organization, &c., of the staff, and, following the Committee's report, several far-reaching improvements and changes were introduced. Not the least of these were the formation of a distinct sanitary branch of the staff in West Africa and the institution of an advisory medical and sanitary committee for Tropical Africa at the Colonial Office. To the sanitary department is entrusted, under the principal medical officer of each colony, the important work of dealing with epidemic and endemic disease from the point of view of the public health, and the prophylaxis of the same. Its duties are numerous and onerous, and its formation has been justified in many ways, particularly in its prompt dealing with the outbreaks of yellow fever which occurred in 1910 and 1911.

At the present time the total number of officers in the West African Medical Staff exceeds 200, the increase being necessitated by the formation of new "stations" required through the opening up of the country and the marked commercial activity which prevails, and, as far as possible, all new recruits undergo a training in tropical medicine at either the London or Liverpool Schools before leaving England for West Africa.

Report.

REPORT ON THE SECOND INTERNATIONAL SCIENTIFIC CONFERENCE ON LEPROSY.

By The Hon. J. E. GODFREY, M.D., C.M., Surgeon-General, British Guiana.

*Special Delegate to the Conference for the Colonies of British Guiana and the Bahamas.**

DR. GODFREY publishes a very interesting account of the Second International Congress on Leprosy in the *British Guiana Annual* for 1910. As readers may not easily be able to get this Report, we publish it in some detail. Dr. Godfrey states that the Conference was opened by His Majesty King Haakon at Bergen, on August 15, 1909.

Forty-eight official delegates, representing twenty-two countries, were present, and in addition a large number of learned societies from different countries were also represented.

The following representatives from Great Britain and the British Colonies were present: Arthur Newsholme, M.D., Sir Malcolm Morris, K.C.V.O., delegates of the British Government; Dr. R. J. Bull, delegate for the Commonwealth of Australia; Dr. C. F. K. Murray, delegate for the Colonies of the Cape of Good Hope and Natal; Dr. George Turner, delegate for the Colonies of the Transvaal and Orange River; Sir Allan Perry, M.D., delegate for the Colony of Ceylon; Dr. J. E. Godfrey, delegate for the Colonies of British Guiana and the Bahamas; Dr. B. Granville Corney, delegate for the Colony of Fiji.

As a result of the deliberations of the Conference, the following resolutions were agreed to with practical unanimity, only two of the delegates voting against them:—

(1) The Second International Scientific Conference on Leprosy confirms in every respect the resolutions adopted by the First International Conference of Berlin, 1897.

Leprosy is a disease which is contagious from person to person, whatever may be the method by which this contagion is effected. Every country, in whatever latitude it is situated, is within the range of possible infection by leprosy, and may, therefore, usefully undertake measures to protect itself.

(2) In view of the success obtained in Germany, Iceland, Norway, and Sweden, it is desirable that other countries with leprosy should proceed to isolate their lepers.

(3) It is desirable that lepers should not be permitted to follow certain occupations which are particularly dangerous in respect to the contagion of leprosy.

In every country and in all cases the strict isolation of leprous beggars and vagrants is necessary.

(4) It is desirable that the healthy children of lepers should be separated from their leprous parents as soon as possible, and that these children should remain under observation.

(5) An examination should be made from time to time of those who have lived with lepers, by a competent physician.

(6) All theories on the etiology and the mode of propagation of leprosy should be carefully examined to ascertain if they accord with our knowledge of the nature and biology of the bacillus of leprosy.

It is desirable that the question of the transmissibility of leprosy by insects should be elucidated, and that the possibility of the existence of leproid diseases among animals (rats) should receive early study.

(7) The clinical study of leprosy induces the belief that it is not incurable. We do not at present possess a certain remedy. It is desirable, therefore, to continue the search for a specific remedy.

Signed by
Dr. ARMAUER HANSEN,
President of the Conference.
Dr. H. P. LIE,
Secretary-General.

and the following Secretaries:—

Dr. E. ARNING (Germany).
Professor E. EHLERS (Denmark).
Dr. J. M. H. MACLEOD (England).
Dr. J. DARIER (France).
Dr. DUBOIS-HAVENITH (Belgium)
Dr. E. SEDERHOLM (Sweden).
Dr. KR. GRON (Norway).
Dr. LYDER BORTHEN (Norway).

The above resolutions may conveniently be read in conjunction with the following resolutions passed at the First International Conference on Leprosy held at Berlin in 1897:—

(1) In all countries in which leprosy occurs in foci, or is widely distributed, isolation is the best means of preventing the spread of the disease.

(2) The system of compulsory notification, supervision and isolation, as carried out in Norway, should be recommended to all nations possessing local self-government and an adequate number of physicians.

(3) It must be left to the legally constituted authorities, after consultation with the sanitary authorities, to determine the special regulations, which must be adapted to the special social constitutions (of each country).

Acting on a request from the Colonial Office the delegates from Great Britain, Dr. Arthur Newsholme and Sir Malcolm Morris, arranged a meeting of the delegates from the British Colonies at which the whole subject was discussed. On the day following the last sitting of the official conference, the following statement and recommendations were unanimously passed:—

We the undersigned delegates from the British and certain Colonial Governments unanimously approve the resolutions adopted by the Second International Conference on Leprosy held at Bergen, Angust 16 to 19, 1909.

(1) Leprosy is spread by direct and indirect contagion from persons suffering from the disease. The possibility that indirect contagion may be effected by fleas, bugs, lice, the itch parasite, &c., has to be borne in mind. Leprosy is most prevalent under conditions

* From the *British Guiana Medical Annual* for 1910, Demerara, 1912.

of personal and domestic uncleanliness and overcrowding, especially where there is close and protracted association between the leprous and non-leprous.

(2) Leprosy is not due to the eating of any particular food, such as fish.

(3) There is no evidence that leprosy is hereditary, the occurrence of several cases in a single family is due to contagion.

(4) In leprosy an interval of several years may elapse between infection and the first recognized appearance of the disease. It is a disease of long duration, though some of its symptoms may be quiescent for a considerable period and then recur.

(5) The danger of infection from leprous persons is greater when there is discharge from mucous membranes or from ulcerated surfaces.

(6) Compulsory notification of every case of leprosy should be enforced.

(7) The most important administrative measure is to separate the leprous from the non-leprous by segregation in settlements or asylums.

(8) In settlements home-life may be permitted under regulation by the responsible authorities.

(9) The preceding recommendations if carried out will provide the most efficient means of mitigating the leper's suffering and of assisting in his recovery, and at the same time will produce a reduction and ultimate extinction of the disease.

Signed by

ARTHUR NEWSHOLME, M.D.,
MALCOLM MORRIS, K.C.V.O.,
Delegates from the British Government.
R. J. BULL, M.D., delegate from the Commonwealth of Australia.
CHARLES F. K. MURRAY, M.D., delegate from the Colonies of the Cape of Good Hope and Natal.
GEORGE TURNER, delegate from the Colonies of the Transvaal and Orange River.
ALLAN PERRY, M.D., delegate from the Colony of Ceylon.
J. E. GODFREY, M.B., C.M., delegate from the Colonies of British Guiana and the Bahamas.
B. GRANVILLE CORNEY, delegate from the Colony of Fiji.

The above when read in conjunction with the official resolutions passed by the Conference represent the line of administrative policy which Dr. Godfrey considers should be adopted for the stamping out and prevention of leprosy in British colonies.

It will be seen that the essential points are :—

(1) The notification of every case of leprosy.

(2) That the disease is spread by direct or indirect contagion.

(3) The proper and efficient isolation of all lepers.

(4) That the disease is not due to the eating of any particular food.

(5) That there is not the slightest proof that leprosy is hereditary.

(6) The treatment of lepers should be continued and every known remedy tried, and the search for a specific remedy steadily continued.

In British Guiana these are the lines on which the campaign against leprosy is being carried out.

Dr. Godfrey especially alludes to the fourth resolution passed by the Conference, and the third and eighth passed by the British and Colonial Delegates.

He holds that as there is no proof that leprosy is hereditary lepers might be allowed to marry. He therefore recommends, that special quarters be set aside for married lepers, on the understanding that every child born is removed at birth and placed either in the Orphan Asylum, or given to healthy relatives or friends.

In this connection he submitted the following:—

(*a*) Mr. Wellesley C. Bailey, Superintendent, Mission to Lepers in India and the East, in his paper entitled "Leprosy in British India," in quoting from the report of the Leprosy Commission of 1890-1891, says: "We do most heartily agree with their pronouncement that leprosy is not diffused by hereditary transmission, which pronouncement was most emphatically endorsed by the National Leprosy Conference of 1897." He goes on to say: "Hence we regard the segregation of the as yet healthy children of lepers from their diseased relatives as one of the most practical steps which has been taken in the fight against this disease in India during the last seven years.

"So far as we are aware, the Mission to Lepers in India and the East is the only body that has adopted this manœuvre, shall we call it, in its warfare against this disease. The Mission to lepers has added several new homes for children during the last few years, though this work was begun many years ago. In these homes the results gained have been more than encouraging—they have been beyond the most sanguine expectations successful. Practically the whole of the children thus cared for during the past twenty years have escaped the disease, the very few exceptions being in all probability cases of contagion rather than heredity.

"Many of the children thus rescued in their childhood have since married and have become parents, and neither in them nor in their offspring is there any sign of the disease.

"To quote again from the pronouncements of the Leprosy Commissioners, we find the following: No authentic congenital case has ever been put on record, nor was one seen in this country."

And speaking of one of the homes for the rescue of such children which they had visited, and where they had spent considerable time in making investigation, they wrote as follows: "The facts obtained from the Orphanage at the Almora Asylum disprove the existence of a specific hereditary predisposition."

"The Government of India would be well advised if they were to encourage the establishment of such homes as we have mentioned by every means in their power, for we regard these homes as strategic outposts in this warfare."

In a comparatively recent article by Dr. Ernest F. Neve, of Kashmir, which appeared in the *British Medical Journal*, the following striking sentences appear :—

"Heredity appears to play but a small part.

"Children of lepers at birth are free of disease, but unless separated from their parents, they are almost sure to develop it within a few years."

"If the disease is to be stamped out, the most important measures to be taken are, in my opinion, first to separate healthy children from their leprous parents; secondly, to withdraw lepers from the general community as completely as possible."

(*b*) Dr. Matias Duque, Secretario de Sanidad y Benefiencia de la Republica de Cuba, in an address on leprosy delivered at Hospital No. 1, and reprinted from "Sanidad y Benefiencia," Official Bulletin of the Department No. 3, June, 1909, Havannah, Cuba, a copy of which was given to each of the delegates, says:—

"As leprosy is a contagious disease, I do not understand why the law issued in the midst of the confusion of the past, which prohibits marriage between lepers, is still kept in force. To my way of thinking, this prohibition is as unjust as it is useless, and as it is barbarous on account of its cruelty. To prevent the marriage of the leper, the presumptive criminal of the illusory or imaginary crime of transmitting the disease by inheritance to his offspring, is one of the most outrageous things which were done at the beginning of the century! To confine a leper and to condemn him not to love, nor to experience the greatest and sublimest pleasure in the world, I believe is the greatest torture that modern man can impose on another man. The lepers may marry among themselves and with healthy persons, if the latter are willing to follow them to the leprosery and to remain in confinement with them. The only thing to which the married leper should be obliged is to deliver to the State for its sequestration and care the offspring of such union, as worthy of respect as any other. I have been sustaining this view for more than eight years."

During his stay in Bergen Dr. Godfrey discussed in detail the administration of Leper Asylums or settlements, and the steps to be taken to stamp out the disease with delegates from different countries, and more especially with Dr. Armauer Hansen, the great Norwegian authority, and the discoverer of the bacillus of leprosy.

With reference to the isolation of lepers all were agreed that compulsory segregation in asylums or settlements is the ideal method, but it was recognized that there are difficulties in the way in carrying this out in its entirety, and that under certain restrictions and regulations isolation outside of the asylum at the expense of the leper or some other person may be permitted, provided such isolation is efficient. There is no question that lepers who are suffering from ulcerated surfaces are the most dangerous with regard to contagion, as not only are they directly contagious, but flies may carry the disease from person to person. In all countries, and especially in Norway, it has been found that the disease decreases in proportion to the complete isolation of those suffering from ulcerated surfaces. Dr. Godfrey would therefore recommend that only those persons should be permitted to be isolated outside of the asylum, who are free from ulcerated surfaces, and even in such cases that on the disease taking on the ulcerative form the leper should be removed to the asylum.

With reference to the fencing in of asylums every one with whom this subject was discussed entirely agreed that it was essential that the lepers should be efficiently prevented from leaving the asylum and spreading the disease either directly or indirectly.

The treatment of leprosy occupied a prominent position in the deliberations of the Conference, but the Conference as a body did not pronounce in favour of any known treatment, as it had not been proved that any certain remedy existed.

Dr. Godfrey discussed the Nastin treatment of Professor Deycke with several of the representatives and the views generally expressed coincided with those held in British Guiana, that is, that Nastin did undoubtedly act directly on the bacillus of leprosy by destroying it, and further that an improvement in the leper's condition with a return of sensation in areas previously anæsthetic had been observed, but it remained to be proved that the destruction of the bacilli was complete and permanent.

THE RAT PROBLEM.

MR. RODIER, Hawthorn, Victoria, Australia, sends a pamphlet for publication on the problem of destroying rats. The method seems to have some merit in it, so we publish it *in extenso*.

Mr. Rodier says: "There is little doubt that rats are an appalling world-wide calamity, and have been the cause of immense loss of life in different parts of the world, and the destruction of an enormous amount of property. Science tells us that the bubonic plague is spread by rats, and without the extermination of these rodents it will be impossible to get rid of the plague. Up to the present they have defied all the means that have been used to get rid of them. In India during the last fourteen years there have been 7 million deaths due to plague, or an average of half a million per year, or 1,370 per day. Truly an awful record. The greatest number of deaths in one year was 1,204,194 in 1907. Sir James Crichton-Browne estimates the damage done by rats at one farthing per day each, and estimates rats in England at one to the acre, thus causing a loss of £15,000,000 yearly in England alone. In cities it is estimated that there is one rat to every person, and so a city of 1 million people sustains a loss of over £380,000 per annum, or at the rate of £380 for every 1,000 rats, or over £1,000 per day. Not only that, there is an enormous expense going on to try and keep the rats in check, which up to the present has not proved successful. W. R. Boelter, in his book, 'The Rat Problem,'* gives a most interesting history of rats extending over hundreds of years,

* "The Rat Problem," by W. R. Boelter. Published by John Bale, Sons and Danielsson, Ltd., Great Titchfield Street, London, W. 2s. 6d. nett.

but fails completely to show any practical solution of the difficulty, and leaves the matter very much in the same position as it was. Under these circumstances I think that the Rodier method of destruction should get a fair and straight-out trial on its merits, and over a good-sized area, extending over several years, as there is little doubt that with fair play it will wipe the rats completely off the face of the earth, and at a minimum expense, and in a short space of time, and without any drawbacks of any kind. The Rodier method can be summed up shortly as follows: Use such plans as catch the rats alive and uninjured; then kill all the females and liberate all the males, and for convenience sake cut off half the tail of all males let go alive, so that they will be known if caught a second time, and not counted. Keep an account of the numbers of females killed and the males let go. In explanation of this scheme, I think, upon investigation, the following statements will be found to be absolute facts, viz.:—

"(1) Rats are polygamous.

"(2) Because of being polygamous they have become a pest.

"(3) This polygamy is caused by the plans at present in use to catch the rats.

"(4) It is impossible for them to be a pest and at the same time polyandrous.

"Now, there is little doubt that the rat is like all other animals, viz., the males are more venturesome and travel about more than the females, consequently more of them get caught in the traps and other plans used for their destruction. The result of this is that the rats that are not caught live in a polygamous state. Because of being polygamous the females are very much more prolific than they otherwise would be, and produce more females than males. Consequently, anything that kills the males increases the pest, and acts in the same way as the proverbial snowball or the notorious chain-letter—the longer they are continued the greater becomes the number of the rats, and that is why they have increased all over the world in spite of the millions of millions that have been killed. Now, the remedy lies in using such plans that catch the rats alive; then kill all the females and liberate all the males, and for convenience sake cut off half the tail of all the males let go. By doing this the males will soon exceed the females in numbers, and when they do this they will persecute the females so that those that cannot be caught do not breed. They will also kill what young ones may be born, and when they largely exceed the females they will worry the remaining ones to death. By this means *all* the females are exterminated, and when this is done the males will die off by old age, and so complete and entire extermination is brought about at a minimum expense and in a short space of time and without any drawbacks of any kind or risk of disease, poisons, &c. The greater the excess of males the quicker the extermination. Now, I am fully aware that a great many people will ridicule this plan, and say it is not so, but I wish to say to them that I have proven this plan to be an absolute and positive certainty with the rabbits in Australia over an area of 64,000 acres, as I have had twenty-seven years' experience amongst the rabbits, and have followed my own scheme, under very adverse circumstances, for nineteen years of that time, and know what I say to be a positive, proven fact. Now, I don't say that I have proven it with the rat, as I am not in a position to do so, but I have proven it with the rabbits, and if it be a success with the rabbits, why not with the rat, or any small bird or animal pest? It is at least worth a fair and straight-out trial on its merits, and over a good-sized area of country, and extending over a term of years.

"A good many people no doubt will say that I am wrong when I say that more males are killed than females, and that the plans at present in use kill more females than males, and will back this statement up by giving the numbers that are caught, showing that more females are caught than males. This, no doubt, will be ample proof to them that the statement made by me—viz., that more males are killed than females—is entirely wrong. In explanation of this, I want people to understand that the damage has already been done, and that the rats are at present polygamous, and have been polygamous for hundreds of generations. This causes more females to be born than males, consequently more are likely to be caught, and this is what I think will be found to be the case at the present time; and yet, according to the numbers born, a proportionately greater number of males are killed than females. Assuming that the rats at the present time are born at the rate of two females to one male, then 100 females will have to be caught to every 50 males before they are caught *pro rata* to the numbers of each sex born. If, on the other hand, only 75 females are killed to every 50 males, then more males are being killed than females in proportion to the numbers of each sex born, and this, I think, will be found to be the case with the rats at the present time. Under these circumstances, although more females are killed than males, the rats actually increase because a lesser proportional number of females are killed than males to the numbers of each sex born.

"Now the difficulty is to find out what are the numbers of each sex born, and that can only be found out by experimenting in enclosed areas. What is known as the Randwick test for the rabbits showed that where the rabbits were kept polygamous the females were born at the rate of three females to one male. Other tests, one of which extended over sixteen years, and over 64,000 acres, conclusively proved that more females were born than males, or at a rate of 66·88 males to 100 females. The results of another man's investigations, extending over nine different counts, average twenty females caught to one male. Other counts have been made which have further shown that more females exist than males. Now, if the rats were born in exactly equal sexes, then any plan that killed 101 females to 100 males would eventually exterminate them. On the other hand, if 101 males were killed to 100 females, they would never be exterminated, but continue to increase, in spite of the many millions that would be

killed annually. Now, the remedy lies in never killing any of the males and killing all the females that can be caught, and then you are sure that the greatest percentage of females are killed in proportion to the males, and that is all that are caught, also that none of the males are killed, consequently by this means you obtain the total maximum amount of good. Now the expression "the maximum amount of good" is synonymous with the expression "the minimum amount of harm," and, as the Rodier method of rat destruction combines the two—viz., kills the females and not the males—the total maximum amount of good is obtained by following the plan, as the good that is done by the killing of the females is not counterbalanced by the harm that is done by the killing of the males, as is the case with the present methods of destruction. Now most people cannot see why the males should be let go after once catching them, and cannot overcome their prejudice in this respect. The reason for letting the males go alive is that the male is the only animal that will prevent those females that it is impossible to catch, from breeding, and that will kill the young ones and the females that cannot be caught. It is the case of setting a minor thief to catch a major thief. Of course, if *all* the rats could be caught *all* would be killed, and so they would soon be exterminated; but that is just where the trouble comes in, as it is impossible to catch *all* the rats by any known means, and so the Rodier method must be applied to get rid of *all* the females, and when this is done the males will die off by old age, and so complete extermination is brought about by the only practical plan yet known.

"Darwin, in 'Origin of Species,' chapter on Sexual Selection, says: 'This leads me to say a few words on what I have called sexual selection. This form of selection depends not on a struggle for existence in relation to other organic beings, or to external conditions, but to a struggle between the individuals of one sex, generally the males, for possession of the other sex. The result is not death to the unsuccessful competitor, but few or no offspring.' It is a curious fact, nevertheless a true one, that all animals and birds kept by man for profit are kept in a polygamous state, such as sheep, cattle, horses, pigs, goats, fowls, and birds of all kinds. Anyone who kept these animals or birds polyandrous, and at the same time for profit, would be looked upon as a fool. Yet such animals as the rat, all over the world, the rabbit in Australia, and no doubt the starlings, sparrows, and other pests, are kept polygamous, and yet people wonder why they become a pest and cannot be exterminated. Now, if they would only stop using the present plans of destruction and follow the Rodier method, there is little doubt that the rat, the rabbit, the starling, the sparrow, and any small animal and bird pest could be wiped completely out of existence if required, and at a minimum expense, and in a short time. If, on the other hand, these pests are continued to be kept polygamous, they will continue to increase; and the greater the percentage of females to the males (provided there are sufficient males) the more prolific will those females be, and the greater will be the percentage of females born, and consequently the increase more rapid.

"One of the great advantages of the Rodier method is that no matter into what nooks or crannies the female can get to have its nest, there the males can go to kill the young ones; and they will do this if they are kept in a polyandrous state. When people generally realize the fact that every male rat that is killed increases the pest, then—and not till then—will the difficulty be overcome. Man was given control of all dumb animals, and it is the duty of those people who are directly interested in the extermination of any of the above pests to thoroughly understand the habits of the animal they are trying to get rid of, and if they will do this, they will find that the Rodier method, if properly applied, will wipe most small animal and bird pests out of existence, if required.

"If the plan were taken up properly, I should say that in two years enough females would be killed to cause the rats to be in equal sexes, and when that is brought about man has the upper hand of the rats, and has turned the corner towards extermination, as, after two or three years more, hardly any females would be left. It is a plan that increases in strength as it progresses (like the proverbial snowball or the notorious chain-letter), until extermination is achieved. From a humanitarian, scientific and public health point of view, the question should at once be taken up by the authorities, and from a commercial and monetary aspect, the various Chambers of Commerce and financial institutions throughout the world should support the scheme. Pressure should be brought to bear upon the Departments of Public Health throughout the world to at once take the necessary steps and prove the practicability and soundness of the plan.

"In conclusion, I may say that I sincerely hope that the various Governments, Councils, Boards, &c., who have any one of these questions under their care in the various parts of the world will sink their prejudice and look at the question broad-mindedly and give the Rodier plan a fair and straight-out trial on its merits before they condemn it, as there is little doubt that it is the practical solution of this great problem, and one that will give the maximum amount of good at a minimum amount of expense, and in the shortest time, and at the same time is very simple and easy of application and free from any drawbacks of any kind, and applicable to very large areas; in fact, the larger the area, other things being equal, the less the proportional cost per acre. It could easily be applied in any city or town throughout the world that is troubled with rats, as owing to the fact that the rat is only to be found where there is population, the agricultural lands or sea would form a sufficient natural barrier fence. This would confine the experiment, for all practical purposes, to a fixed area, which would not be subjected to be inundated by outside rats to any noticeable extent. Trusting that people will soon overcome their prejudice for anything new, as it will not be long, after coming into general use, before the rats are wiped completely off the face of the earth."

Notes and News.

HIS MAJESTY THE KING is to visit the London School of Tropical Medicine on July 17. During his visit he will lay the foundation stone of a new extension which it is proposed to add to the present buildings. The increase in students which has been taking place from year to year at the School has rendered this necessary, and a new laboratory, a new mess-room and further residential quarters are to be added for the purpose of meeting this demand.

CHANGES IN THE YELLOW FEVER BUREAU BULLETIN.—An editorial note in the *Yellow Fever Bulletin* (No. 12, April 1912) states that it is just twelve months ago since the Yellow Fever Bureau was established in Liverpool by the late Sir Rubert Boyce, and the first number of the *Bulletin* issued. Since that date the Scientific Secretary and the Sub-Committee have endeavoured to carry out faithfully the wishes of its late founder, and the present issue is the twelfth and last number of the first volume.

It may be of interest to readers to know that 1,000 copies of each number have been issued monthly, of which over 800 have been sent to all parts of the world.

It has, however, been decided by the Sub-Committee that the *Bulletin* shall appear quarterly in future, and that it shall contain, besides the subjects dealt with up to the present, also the literature relating to dengue and papataci fever, both of which will be treated on parallel lines to yellow fever.

YELLOW FEVER.—The *Yellow Fever Bulletin* for April, 1912 (vol. i, No. 12), in its summary of recent outbreaks on yellow fever states that during the months of March and April, 1912, the following three cases of yellow fever were imported into Rio de Janeiro by ships:—

(1) The Commander of the British steamship "Tunestall," who contracted yellow fever in Recife (Pernambuco), and was landed in Rio in a dying condition. Death occurred March 18.

(2) A passenger from the Brazilian packet boat "Maranhao," *en route* for Santos (Sao Paulo), disembarked in Rio on the fifth day of illness, which had been contracted in Recife (Pernambuco); he died March 30.

(3) A passenger from the packet boat "Minas Geraes," from Fortaleza (Ceará), was landed sick in Rio on March 8. On March 13, the sixth day of illness, he was transferred to the hospital S. Sebastiao, where he died on the 14th.

The details of these three cases were obtained from the *Boletim Hebdomadario de Estadistica Demographo-Sanitaria*, Rio de Janeiro.

INTERNATIONAL RED CROSS CONFERENCE AT WASHINGTON, U.S.A.—Messrs. Burroughs Wellcome and Co., in the special class of exhibitions for methods of packing dressings for service in war, secured the only award. The "Tabloid" compressed form of bandages and dressings was specially selected by the Committee of International judges for this distinction at the recent Conference.

Personal Notes.

Dr. R. Dowden, Medical Officer, Grade II., Federated Malay States, has been promoted to Grade I., and Dr. H. M. C. Green, of the Medical Service of the Straits Settlements, has been transferred to the Federated Malay States as a Medical Officer, Grade II.

Mr. C. B. Holman Hunt is acting as Entomologist of the Agricultural Department, Federated Malay States, during the absence on leave of Mr. H. C. Pratt, who is coming to England on fourteen months leave.

Dr. L. D. Parsons, Assistant Surgeon, Colombo Hospital, Gibraltar, has been appointed Medical Superintendent of the Government Asylum of Colombo, Ceylon, and is leaving England shortly to assume the duties of that office.

Dr. W. A. Whitman, Medical Officer, Grenada, has left that Colony on six months leave of absence, during which his duties will be performed by Dr. J. E. Copland.

Recent and Current Literature.

"Sleeping Sickness Bulletin," No. 38, 1912, vol. iv.

List of Contents.—The above number of the "Sleeping Sickness Bulletin" contains the following papers and other information of interest: "*Trypanosoma rhodesiense*"; "Transmission"; "Chemotherapy"; "The Leucocytes in Trypanosomiasis"; "The Vitality of Trypanosomes in the Cadaver"; "Animal Trypanosomiases"; "Tsetse-flies and their Bionomics"; "The Biology of Trypanosomes, and other papers"; Sleeping Sickness News—Uganda (map), German East Africa (map), Togoland; Monthly List of References.

"Proceedings of the Royal Society of Medicine," vol. v, No. 7, May, 1912.

The Action of Radium on Bacteria.—Chambers and Russ discuss the bactericidal action of radium emanations in a paper read at a Laboratory meeting of the Pathological Section of the Royal Society of Medicine held at the Middlesex Hospital, April 2, 1912. Their conclusions are: (1) that the emanation in concentrations of less than a milli-curie per cubic centimetre has a marked bactericidal action; (2) that agglutination of bacteria in distilled water is an early sequel to their irradiation; and (3) that bacteria are more quickly destroyed by the emanation than are opsonin and leucocytes.

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1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communication.

OBSERVATIONS ON THE ETIOLOGY OF VACCINIA AND ON THE CULTIVATION OF THE MICROBE OF VARIOLA.

By W. J. Simpson, C.M.G., M.D., F.R.C.P.

Professor of Hygiene, King's College, and Lecturer on Hygiene, London School of Tropical Medicine.

In an article dealing with the "Etiology of Vaccinia and Variola," Dr. Klein gives, in the Medical Officer's Report to the Local Government Board for 1892-93, published in 1894, an account and illustrations of the bacillus he found in the early stages of vaccine lymph taken from a calf, and of a similar bacillus in variolous lymph. He was unable to cultivate either.

Studying the same subject from a different point of view, I had, since my arrival in India in 1886, been searching for cow-pox among cattle, with the object, if possible, of cultivating the vaccinia micro-organism from them. I found, however, that the cow-pox I was searching for turned out to be in India a severe affection, and I gradually came to the conclusion that many of the cases were small-pox. In fact the cattle plague in Bengal is called by the Indians gotee and bassunto, two names to denote small-pox. The Indian Cattle Plague Commission of 1871, of which Colonel Kenneth McLeod, I.M.S., was Secretary, came to the conclusion that the Indian cattle plague, which included gotee or matah, was allied to, if not the same as that which used to prevail in England. My experience leads me to the conclusion that the term gotee or matah includes a number of diseases, of which small-pox is one, just as the term rinderpest may include a number of diseases difficult to distinguish from one another. There is a gotee with an eruption and one without an eruption. I am fairly certain that some of the epidemics that go under the name of cattle plague or rinderpest in Bengal are small-pox. Anyone who makes a *post-mortem* examination of a virulent case of small-pox in the human subject and then a *post-mortem* of a case of cattle plague or rinderpest, as seen in Calcutta in a buffalo or cow, cannot fail to be struck by the similarity in the naked-eye appearances of the lesions which have been produced, and their seat. Dr. Duncan Stewart, of Calcutta, as early as the "forties" of last century, suspected a relationship between the two diseases. Veterinary Colonel Hallen, the President of the Indian Cattle Plague Commission of 1871, held a similar opinion.

When the cattle plague prevailed in England and on the Continent in the eighteenth century, it was held by many, especially by M. Vicq D'Azyr and by Dr. Layard, who wrote on the subject in 1756, and again in 1780, "that it was an eruptive fever of the variolous kind." There is also the incident of the vesicle on Mr. Handcock's hand, a veterinary inspector at Uxbridge, in London, who accidentally inoculated himself in 1865 when engaged on the *post-mortem* of a bullock, which had died of cattle plague. The vesicle was seen by Mr. Rayner, Professor Spooner, Dr. Quain and Dr. Murchison, who recognized in it the character of the vaccine vesicle. It was also seen by Mr. Ceely, who stated that it corresponded with some of the cases of casual cow-pox in the milkers.

To return, however, to Bengal. I had in mind the experiments of Macpherson at Murshedabad, who, in 1832, succeeded in obtaining vaccine by inoculating children with the crusts obtained on the twelfth day from an animal suffering from gotee. He tested the vaccination by inoculating two of the children with small-pox virus, but without producing small-pox. There were also the experiences of Mr. Furnell and Mr. Brown in Bengal, who performed similar experiments with animals suffering from gotee, with the result that not vaccine, but small-pox, was produced in the children.

During several years' search among gotee animals I had isolated a diplobacillus from some of them, but the opportunity did not allow of me testing them until 1894, when I came across a buffalo suffering from gotee and with the most profuse eruption on head, neck, body and teats that I have ever seen. The animal a little before its death was shown to several medical men who were asked their opinion as to the nature of the disease. Their reply was unanimous that if it had not been a buffalo they would have said the disease it was suffering from was small-pox. With the assistance of Mr. Haffkine, C.I.E., a diplo-bacterium similar to some of the others previously obtained was isolated. Cultures consisted of rather small diplo-bacteria, which sometimes had the appearance of diplococci, and occasionally a thick diplo-bacillus. This is the type of the culture.

Circumstances did not permit me to test the cultures of this new microbe until some seven to eight weeks after its isolation, but in November, 1894, I inoculated two calves with different aged sub-cultures. For convenience of reference the two calves will be called Calf A and Calf B, and they are classed in Series A.

Series A.—First Set.

In Calf A four out of the fourteen inoculations became vesicular between the fifth and sixth day. Lymph from these vesicles was transferred to another calf, and in this none out of the twenty-one developed, but a secondary vesicle appeared on the ninth day and became a very fine vesicle on the tenth day. The lymph from this vesicle of the tenth day was transferred to a third calf by seven punctures. Vesicles developed at the seat of each puncture, having on the seventh day the appearance of ordinary vaccine vesicles of the sixth day. With this lymph a child was inoculated on the arm and a calf on the abdomen and both showed good vesicles on the sixth day. The vesicles on the calf and child were declared to be vaccine vesicles by the medical men, native and European, interested in the proceedings, among whom were my assistants, Drs. Ram Chunder Mitter, J. Dutta and S. B. Ghose; also the late Colonel Alexander Crombie, C.B., I.M.S., and Colonel W. G. King, C.I.E., I.M.S., now retired from India and living in England.

From the child other children were inoculated, and each presented well-developed vaccine vesicles. The lymph was transferred from these to other children,

and so through a series. The children were later vaccinated with ordinary vaccine lymph, but did not take.

SERIES A.—SECOND SET.

Calf B was inoculated in forty places with cultures, and on the sixth day many of the punctures presented a similar appearance to that usually found on the fourth day in ordinary vaccination, but later they receded and dried up. On the eleventh day two well-developed vesicles appeared, and on the twelfth day a third vesicle. The lymph of the two first was transferred to calf B^1 by seventeen punctures, all of which presented good vesicles on the fifth and sixth day and a secondary vesicle appeared on the seventh day. Plate I, fig. 1.

Lymph from these vesicles was transferred to a calf and child. Both showed good vesicles, but on the seventh day a crop of secondary vesicles appeared on the calf and a measly eruption on the child which faded on the ninth day. From this child a series of children were vaccinated, all showing good vesicles and with no eruption. Plate I, fig. 2, shows vesicles on one of the children. The children were later vaccinated and all resisted.

This double set of experiments, expanded in various ways such as re-transferring the lymph from the children on to calves, again from calves to children, and from children to children, lasted from November, 1894, to February, 1895.

INTERMEDIARY SET OF SERIES A.

There were some intermediary sets in which fresh cultures were used on calves and mostly raised secondary vesicles, but they were not carried beyond the calves and on to children, because of the early appearance of the Indian rinderpest symptoms among them. I do not propose for the present to deal with this subject, or with the many experiments made to immunize cattle against this disease. I shall confine my remarks to the effects of the cultivated diplobacterium when inoculated on the skin of calves—viz., the production either of vaccine vesicles at the seat of inoculation maturing on the tenth day or eleventh, or the appearance of secondary vesicles on the tenth or eleventh day, and to the observation that lymph taken at an earlier period from vesicles at the site of the inoculation acts in a different way.

During the months of December, January and part of February, the cultures from the buffalo were sub-cultured once a week and a new series of experiments (Series B) was begun with the microbe in February, 1895.

SERIES B.

In order to eliminate the rinderpest factor as much as possible, I selected another place for the experiments, and isolated the animals for a period of ten days. This being done, three calves, C, D, and E, were inoculated the same day; C with cultures derived from the lung of the buffalo, D with cultures from the spleen, and E with cultures from the liver. C took ill on the seventh day, and died on the tenth of Indian rinderpest; nothing but a secondary papule appeared on the eighth day.

SERIES B—FIRST SET.

In D, a vesicular rash appeared on the left side of its abdomen on the sixth day, seven secondary nodules or papules appeared on the thighs and scrotum on the seventh day, also a small blister patch on the upper gum. The temperature rose to 105° F. on the eighth day, to 106.6° F. on the ninth day, and the animal had loose motions, yet it continued to feed well. One of the papules became vesicular on the tenth day and four new papules, two under the armpits and a crop on the buttocks, appeared. The temperature was 106.8° F. and there was a generally measly rash on the thighs and abdomen. On the eleventh day two other papules became vesicular, but the vesicles were small. From the three secondary vesicles lymph was transferred to another calf which presented four vesicles on the sixth day, the lymph of which was transferred on the seventh day to two children (A and B) and a calf D^1. Plates I and IV, fig. 3, show vesicles on child A. All gave excellent vaccine vesicles, and from these a third series of calves and children was vaccinated. The children were later vaccinated with ordinary vaccine lymph and all resisted. D calf continued ill until the sixteenth day and then gradually recovered.

SERIES B.—SECOND SET.

Calf E had three primary vesicles on the seventh day, but not characteristic. A calf inoculated with their lymph gave small, but unsatisfactory, vesicles. The temperature of calf E rose to 104° F., and there was a vesicular or herpetic rash on the abdomen and thighs. On the eighth day two secondary papules appeared on abdomen, one of which became a vesicle on the tenth day. This vesicle was well raised and developed on the eleventh day, and its lymph was transferred to another calf, E^2, which developed excellent vesicles on the fifth day, from which was started a fourth series of successful vaccinations in calves (Plates I and IV, fig. 4, show vesicles on calf E^2) and children. Plates I and IV, fig. 5, show vesicles on one of the children. Later the children were vaccinated with vaccine lymph and all resisted. The temperature of calf E continued high until the eighteenth day, but beyond this there were no signs of illness. It was vaccinated three weeks later, but did not take.

In the second and third sets of Series B the lymph was transferred from calf to calf and from calves to children, and again from children back to calves.

SERIES C.

Calf F was inoculated in March with a culture of the microbe kept in hydrogen for thirty-nine days. On the eighth day four conical vesicles appeared at the seat of punctures. They were not umbilicated, but they contained clear lymph, which was transferred to two children, who eight days afterwards showed no signs of having taken, and were, therefore, vaccinated with ordinary lymph. Three days after, one child showed an eruption of twelve papules, which became vesicular on arms, legs and body, and the other child thirty papules, which also became vesicular; both

had fever. The results were similar to those following inoculation with variolous lymph of a mild type, such as was familiar to Sutton in the eighteenth century. The local vaccination with ordinary lymph failed in both cases.

Calf F remained well, and was vaccinated on the fourteenth day. It was then vaccinated with ordinary lymph, and was not examined until the fourth day of the vaccination when this was found to have failed, but the animal had on it a profuse eruption. There were crusts over the left eyebrow and under the right eyelid, also over different parts of the face, and on the throat and dewlap; also over the ears there were vesicles and pustules very similar to what is seen in cases of small-pox. There were also pustules on the rump. Plates II and III, figs. 6, 7, 8 and 9, show calf F with eruption on different parts of body. The temperature was 103.2° F. Next day it was 104° F., and there were loose motions. After this the temperature dropped to normal, and the animal, with the exception of its eruption, appeared quite well. A calf inoculated with the crusts and with the serum and lymph squeezed out of the crusts, had a rise of temperature on the sixth day, an eruption on the neck on the seventh day, slimy motions, sore and ulcerated mouth and great weakness on the ninth day and died on the tenth.

Later in the year, during the rains, I began another series of experiments with the cultures, but with a very curious result, possibly due to some contamination that I was unable to discover. A spurious vesicle was produced on the calves, and this vesicle passed through the several stages of papule vesicle crust and scar. It had at some stages a resemblance to a vaccine vesicle, but its final appearance was flat and more like a blister. It could be transferred from calf to calf but not to children, and it did not render the calves immune to vaccination with ordinary lymph, as was the case with the other series.

It may be of interest to note here that it is difficult to maintain effective vaccination from calf to calf or from calf to child in Calcutta during the rains, and that natural small-pox in the human being seems to lose much of its infective power at this season of the year.

The results of these observations bring the subject to a more advanced stage than that reached by the experiments made by me in the years 1884 and 1885, when Medical Officer of Health for Aberdeen and when, owing to the experiments of Chauveau and Klein, the trend of opinion was that it was impossible to produce vaccine by inserting the virus of human small-pox into the cow: that if any vesicle was produced it was a small-pox vesicle, and that the successes of previous experimenters had been due to accidental contamination with vaccine. My experiments then demonstrated that it was possible to produce vaccine by the passage of human small-pox virus through the cow, and that the older experimenters were correct in their observations. I did not publish the results at the time for I wished to supplement them on a larger scale. The fact, however, that such successful experiments had been made, and 1,200 children vaccinated from this source was placed before the Royal Commission on Vaccination by Dr. Cory, in November, 1889, at the instance of the medical department of the Local Government Board, over which Dr. (afterwards Sir) George Buchanan, K.C.B., presided, and I further added to that information when at the request of the Commission I sent to it an account of my successful experiments in the same direction carried out in India in 1892, and which appeared in their sixth report in 1897. In the meantime Colonel W. G. King, C.I.E., had published his classical experiments done in Madras in 1891, and for which he got into much trouble owing to the view held by the medical department, that only small-pox could be produced, and that it was impossible to produce vaccine. Since then, Copeman, Klein and Hime, in England, have also proved its possibility.

The observations recorded in this paper help, I think, among other things, to show that both sets of opponents were correct in their observations, though differing in the interpretation of the results, and that the explanation of the difference lay in the maturity of the vesicle produced at the site of inoculation, or in the production of secondary vesicles. Seventeen years is a long period to elapse between the making of certain observations and their publication, but I was always in hopes of having further opportunities of pursuing the subject. For instance, quite apart from natural small-pox in cattle, giving rise to a disease included under the general term of cattle plague or rinderpest, and which under certain circumstances gives rise to vaccinia in men, the animal has yet to be found that exalts the virus and conveys it to man in the form of epidemic variola. It was because of this line of research and thought that I realized at once the significance of disease in the rat when plague first appeared in Calcutta in 1896. I think, however, it is time these observations should be made known beyond a few friends in order that others, if opportunity arises, may advance this very important subject. Unable in England to follow up this line of research, I recognize that as regards myself, so far as this aspect is concerned, the chapter is closed. But I have not entirely relinquished the study of vaccinia, and I hope in due course to deal with the problem from a different aspect, aided by the experience already gained.

"British Medical Journal," June 29, 1912.

Granule shedding in Treponema pertenue. Ranken, in a memorandum published in the *British Medical Journal*, June 29, 1912, states that after prolonged observation he noted extrusion of granules from the treponema of yaws. The treponema, he finds, exhibits a lateral vibratory movement, and presumedly by means of this, the granule is shot with some force from its body into the surrounding medium. Immediately after extrusion the parasite becomes stationary, but afterwards it begins to make its way through the surrounding fluid. Mobility is distinct, but Ranken failed to see any evidence of a flagellum.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JULY 15, 1912.

THE ETIOLOGY OF VACCINIA AND ON THE CULTIVATION OF THE MICROBE OF VARIOLA.

IT seems an anomaly that at the present day the subject of the relation of vaccinia to small-pox should still be undetermined. With the extraordinary extension of the use of vaccines for many ailments and the precision which obtains in regard to them, it seems impossible to believe that the original discovery of vaccination in connection with small-pox is still unexplained, although many scientists have dealt with the matter. Experience and observation in this, as in many other phases of interpretation, preceded scientific and laboratory teaching, and in the case of small-pox and vaccinia the scientific explanation has not overtaken the findings of practice. Professor Simpson's article, included in the Journal, places the history of the subject clearly before us and at the same time advances our knowledge to a position of greater precision.

One point of special interest at the present moment in Britain, owing to the development of plague in cattle, is brought home very clearly, namely, that our knowledge of the diseases of cattle is faulty in the extreme. It is not only in India that the diseases of animals are undetermined. Professor Simpson refers to the confusion in terms and finds that "gotee" covers as many diseases in India as "cattle plague" in this country. There is a "gotee" with and without an eruption; and, above all, it is interesting to note that the word gotee or matah means small-pox; bringing home the fact observed by many medical men, that the eruption seen in cattle is apparently identical with the eruption of small-pox.

From a buffalo suffering from a fatal attack of gotee and pronounced by several observers to be covered by a varioloid rash, Professor Simpson isolated a diplobacillus; from subsequent subcultures of this organism two calves were inoculated. From one calf thus inoculated, lymph was taken from a secondary vesicle, inserted into a third calf, and from the vesicles in the third calf children were successfully vaccinated and rendered immune to ordinary vaccine lymph. A similar success attended the inoculation of the second calf. This is a noteworthy and most important observation, being none other than a successful vaccination of children from the products of a culture of the contents of a small-pox-like disease in cattle. This experiment was further elaborated by re-transferring the lymph from children to calves, then from calves to children again, as well as from children to children.

Three months later a second series of experiments was carried out. With cultures from the lung, spleen and liver, three calves were inoculated with one of the cultures from each respectively. The calf inoculated by cultures made from the lung died; the second (cultures from spleen) calf lived to develop secondary vesicles, lymph from which was transferred to another calf and from the vesicles on this calf lymph was taken on the seventh day and inserted into children; the result was a successful vaccination of the children who resisted attempts to vaccinate them by ordinary vaccine lymph.

Many other experiments were made by Professor Simpson, all showing the capability of successful vaccination by cultures made from cattle suffering from cattle diseases, passing under several names, such as rinderpest, gotee (small-pox), &c. Professor Simpson has also shown that it is possible to produce vaccine by the passage of human small-pox virus through the cow, and that children could be successfully vaccinated from this source.

The many different opinions held on this subject seem to be explained by the maturity of the vesicle produced at the site of inoculation or in the production of secondary vesicles.

In all cases the virility of the vaccine is in a descending scale, from small-pox in the cow to a secondary vesicle (cow-pox), and from cow-pox to man, either primarily or after passing through subsequent animals. The further degeneracy of vitality is well known, for after a time arm to arm vaccination fails after a succession of transferences, and one has to revert to the calf (cow-pox) for a renewal of the virus. The completed degeneracy is reduced to almost farcical dimensions in China. Into that country vaccination was introduced by the East India Company in 1801; the vaccine was continued by arm to arm vaccination in children for a century and, in fact, to the present day. The

result is that Chinese children are being vaccinated to-day by material imported 100 years ago; the punctures result in more abortions and naturally the protection against small-pox in China attempted by this method is *nil*. We are, however, quite ignorant of how the virus is exalted in its potency; in other words, how the organism present in small-pox in cattle is kept virulent. In some animals this, no doubt, takes place just as plague is rendered virulent by passing from rats to man and, perhaps, *vice versa;* but the animal has yet to be found that exalts the virus and conveys it to man in the form of epidemic variola.

THE LONDON SCHOOL OF TROPICAL MEDICINE.

We are very pleased to see that the Lord Mayor's meeting in the earlier part of the year on behalf of the London School of Tropical Medicine is about to result in something more than has hitherto been the lot of the School. A strong Committee has been formed with the object of placing the finances of the School on a more satisfactory basis. This is the most important step that has been taken for the School since Mr. Joseph Chamberlain founded it and obtained by his influence money for its erection. It is a project that is much needed, for London has never been much interested in the School, and although during the past thirteen years much has been said of the good work which it has accomplished, yet there is the fact that notwithstanding the honorary services of those interested in its development, the School has until quite recently been living a hand-to-mouth existence. The expenditure in training medical men for the Tropics has always been large, and the London School of Tropical Medicine has been as regards money matters in a much less fortunate position than its younger sister at Liverpool, whose finances have been such that she has been able not only to endow her chairs, but also to finance many important expeditions. This has been due to the fact that the merchants of Lancashire, and of Liverpool in particular, have, under the inspiration of the late Sir Alfred Jones, given generous support to the Liverpool School, realizing the importance of the work that it is engaged in, and that that work cannot efficiently be carried out without ample funds. The school has now a powerful and wealthy Chairman in Sir William Lever, who has advanced in every way he could its interests, and who, like Sir Alfred Jones, kept it in touch with the merchant princes of the North.

Brighter days are, however, obviously in store for the London School of Tropical Medicine. The Committee now formed to assist the School is a most influential one, and will certainly succeed in its efforts. It is of very happy augury that Mr. Austen Chamberlain is the Chairman of the Committee, and that one of its most enthusiastic members is Mr. Harcourt, who, on every opportune occasion since he has been Secretary of State for the Colonies, has done all in his power to interest others in the work and in the needs of the Tropical Schools.

The scheme is at present to secure £100,000, but we think little of this sum will be left for endowment and expeditions if the money is to provide, as we understand it is contemplated, for extension of laboratories and hospital, and a nursing home. The sum needed for an Imperial School of Tropical Medicine worthy of Great Britain was put down a few years ago by Sir Wm. Osler at two millions. £300,000 and more are obtained for local hospitals without very great difficulty. Perhaps it is well to begin by asking for a modest sum, but it is to be hoped that the Committee will not think that the sum of £100,000 is the measure by which the hygienic and medical necessities of an Empire which has tropical possessions the size of Europe and India can be studied.

Annotations.

A Case of Trichophytic Granulomata.—Dr. J. H. Sequeira in the *British Journal of Dermatology* (No.284, vol. xxiv, No. 6, June, 1912), describes a very rare and interesting case of trichophytic granulomata. Such cases have been described on the Continent, but the one under discussion is the first reported in England.

As regards the source of infection, Dr. Sequeira's impression is that the patient contracted the disease from his sister, who was infected on the hand and arms when he (Dr. Sequeira) saw her in 1905. She was at the time of her infection engaged in rag-picking, a very dirty occupation, which might bring her into contact with infected clothes from other countries, as the family lived in a poor locality by the riverside in East London. The infection may possibly have come from Denmark.

The lesions produced consisted of dry scaly areas and extensive granulomatous eruptions of a triangular shape and reddish-brown colour. In addition some of the lesions in the groin were flat and button-like, of a purplish-brown colour, with a smooth dry surface. Nodules from the different areas were examined microscopically, and the fungus, as grown from scrapings of the epidermis and found in the granuloma, was identified by Dr. Sabouraud as the *Trichophyton plicatile.*

This *Trichophyton neo-endothrix*, variety *plicatile*, was described by Sabouraud in 1909. In his work, "Les Teignes," he states that he had only seen it twice in five hundred cases, both in cases of beard ringworm. The first case was a suppurating ringworm of the beard, the lesion resembling kerion, rounded, indurated, with its surface covered with pustules. The hair was broken short. In the second case the lesions were primarily dry, with red circles covered with broken hairs, but later there developed numerous intradermic nodules, discrete and coalescing, and attended with pain.

On microscopical examination the mycelium was

found both inside and around the hairs in the form of ribbon-like filaments.

The cultures are remarkably like those of the crateriform type of trichophyton. They are white and of cardboard-like consistence with a powdery surface. "The surface," Sabouraud remarks, "gives the impression of a silky material which has been allowed to form folds."

The *T. plicatile* can be inoculated into the guinea-pig.

Although Dr. Sabouraud has only met with two cases in which he has found the *T. plicatile*, it is of great interest, Dr. Sequeira says, to know that the fungus is far from uncommon in Copenhagen, for in a recent communication made at the First Northern Dermatological Congress in that city, Dr. Bang reported that this fungus was the commonest met with in Denmark. He describes four types of lesion produced by the organism:

(1) A dry type with a more or less ringed-form eruption. The affection is pilar.

(2) An impetiginous form often complicated with the following.

(3) A sycosiform variety with a firm infiltration in the skin and deep small suppurative lesions.

(4) A kerion form in which there are round or oval plaques characterized by follicular inflammation.

Dr. Bang reports fifty cases of *T. plicatile*, of which thirty-nine were in the beard. One case of the dry scaly eruption had lasted for six months; others were of four months' duration.

Trichophytic granulomata appear to develop in two forms. Sometimes there is a common, chronic ringworm, or more acute lesion upon which a nodular growth develops. In the second type there is a plaque which is studded with nodules. This condition may occur on the scalp or beard region, or on the glabrous skin, the latter form being the one seen in the case just described by Dr. Sequeira.

Motor Aphasia due to Malaria.—Rao reports a case of this somewhat rare condition in the *British Medical Journal*, June 1, 1912. Rao, in opening his paper, says that pure motor aphasia, or subcortical motor aphasia, as Déjerine calls it, is a rare occurrence, and aphasia due to malarial parasites forming an embolus, and blocking the artery supplying Broca's convolution is rarer still, even in places where malarial fevers abound. He, therefore, reports the following interesting and instructive case:—

A young lad, aged 19, was seen on February 26, 1912, with the complaint that he had lost the power of speech, and with the following history: On the previous evening he had had a rigor, vomited, and fell down unconscious. The unconsciousness lasted for about two hours, and he had fever. After he regained consciousness it was found that he was unable to speak.

On admission the temperature was 99·4° F. The heart, lungs, liver, spleen, urine, &c., were all normal: he could not speak, nor was he able to put out his tongue fully, but he had no agraphia. He wrote answers to questions in an intelligent manner. Towards the evening of February 26, his temperature went up to 102·4° F. On February 27, it was normal. On the evening of February 28, he again had a rigor, and the temperature shot up to 105° F. Microscopic examination of the blood revealed the presence of malignant tertian parasites in abundance—three or four in each field. Now and again doubly infected red corpuscles were also seen.

Hypodermic injections of quinine were given on February 28 and 29, and the fever did not recur. On February 29 he regained the power of speech as suddenly as he had lost it. He was given quinine by the mouth for a week more, and was discharged with the advice that he should take 10 gr. of quinine once a week for three months. He has had no recurrence.

Oriental Sore.—Patton, in the "Scientific Memoirs by Officers of the Medical and Sanitary Departments of the Government of India" (New Series, No. 50), publishes an interesting preliminary report on an investigation into the etiology of Oriental sore in Cambay. Oriental sore is said to have existed in that place, Captain Patton says, for the last 250 years and probably was introduced from Persia; it is definitely localized to the town itself, and hardly ever occurs among the villagers living in the surrounding country, except among those who make a short or prolonged stay in the town. It was extremely difficult, however, to obtain any accurate information as to whether the disease showed any tendency to spread among the villagers when introduced by infected people coming from Cambay. Recently, Major Liston, I.M.S., saw a typical case of Oriental sore in a girl in Bombay, who had never been to Cambay, but had resided in Gogo, a seaport town opposite Cambay, which holds much communication with it. This case clearly shows that the disease has a tendency to spread outside the endemic area. Captain Patton worked chiefly at the question of how the disease is spread from man to man and for this purpose experimented with insects, such as flies, mosquitoes, lice and bugs. After a somewhat exhaustive study he concludes that the bug is the most probable transmitter of the disease, and as regards Cambay he has no doubt whatever that it is the only one. These observations do not agree with those of Wenyon and other investigators, and it is by no means easy to understand how the bug can act. However, Captain Patton says that his conclusions were not arrived at hastily, but were a result of a most careful and exhaustive study of the disease and its probable transmitters, so there the matter stands. With so much doubt still existing, however, it is clear that confirmation by some independent worker is very desirable, and until that comes to hand judgment for the present should be suspended.

The Detection of Anthrax Spores in Industrial Material.—Glyn and Lewis, in the *Journal of Hygiene*, June, 1912 (vol. xii, No. 2), contribute a very interesting

paper on "The detection of anthrax spores in industrial material." As the authors say, anthrax is still fairly common in Great Britain both amongst men and animals, and therefore any means for its quick detection must always be of value. The authors' conclusions and summary of the subject in their own words are as follow:—

"(1) There are two methods of examining industrial material for anthrax spores, *viz.*, agar plate cultures and the innoculation of guinea-pigs.

"(2) Though no worker has yet made a large series of examinations of equal portions of the same material by both methods simultaneously, yet the available evidence indicates that animal inoculation is superior, provided that guinea-pigs, not mice, are employed.

"(3) It is better to inoculate two guinea-pigs than one, and to use the centrifuged deposit of the watery extract, though this practice may also increase the mortality from pathogenic anaerobes.

"(4) The inoculation of guinea-pigs is more successful than plate cultures mainly on account of the larger quantity of watery extract usually tested, which more than counterbalances the disadvantage that some of the animals die from anaerobes before they develop anthrax.

"(5) If plate cultures are employed it is essential to examine the superficial colonies after a short incubation, probably twelve to sixteen hours is the most suitable.

"(6) Anthrax spores have been demonstrated by the inoculation method in 21·3 per cent. of 141 samples of industrial material, supposed to have produced anthrax in Liverpool amongst those who handled them. Of these samples 28·6 per cent. were from hides, 22·2 per cent. from wool, 20·6 per cent. from hair, and 7·1 per cent. from bones. The largest proportion of infected samples came from Singapore.

"(7) Anthrax spores have been demonstrated in one sample of hair "disinfected" with 5 per cent. fluid of high coefficient at 100° C., and in two out of six samples of hair disinfected in Germany probably by steam at 105° C. It is practically impossible to completely sterilize certain industrial materials without seriously damaging them; yet partial disinfection should on no account be abandoned, because the perfect method has not yet been discovered.

"(8) Anthrax appears to be steadily increasing among domestic animals, and consequently a larger number of agriculturists are becoming infected. The reason for this dissemination amongst animals is still obscure.

"(9) The authors found *B. anthracis* in a sample of pea meal used for feeding cattle confined to a shippon, one of which died of anthrax. The meal was probably infected from the sack.

"(10) Anthrax is preventable among men and domestic animals, and its ultimate suppression depends largely upon the certainty with which bacteriologists can demonstrate the presence or absence of bacilli in suspected industrial food, or other materials."

Reports.

THE TREATMENT OF LEPROSY.

AT a meeting of the Dermatological Section of the Royal Society of Medicine, held on May 16, 1912, the President of the Section, Sir Malcolm Morris, K.C.V.O., in the chair, Dr. J. H. MacLeod showed a case of maculo-anæsthetic leprosy in a woman, aged 25. The patient was a Creole from the West Indies, her father being an Irishman, her mother a native of the West Indies. She was the youngest of three children, having a brother and a sister who were both married and had healthy children. Her father died when she was young, the cause of death being unknown to the patient. Her mother has suffered from maculo-anæsthetic leprosy for years. The patient, a well-nourished young woman of medium height, stated that the disease was first noticed when she was nineteen years of age as a reddish patch about the size of a shilling, not unlike ringworm, on the back of the right wrist. This gradually spread, taking a year to reach the size of half-a-crown, when it began to assume the characteristics of a maculo-anæsthetic patch of leprosy. She was then put under treatment for the disease. In 1909 she came to England, and since then had been under the observation and treatment of the exhibitor. When she was first seen in 1909 in London the following evidences of the disease were present: Extending across the back of the right wrist there was a band of discoloured skin, which varied in width from one to two inches. It was reddish purple in the centre and brownish at the margins, the border being slightly raised. The affected skin was slightly atrophic, but the languo lavis were still present upon it. A smaller patch about the size of a shilling was present on the back of the hand; this was similar in colour and texture to the larger patch. These lesions were definitely anæsthetic, insensitive to pain from the prick of a needle, insensitive to heat and cold but slightly sensitive to touch. The skin beyond the patches was slightly hyperæsthetic. There was also a small patch on the front of the chest. In addition to the patches on the skin there was slight wasting of the interosseous muscle between the fourth and fifth metacarpal bones. There was no definite thickening of the ulnar nerve. The patient complained, however, of tingling and peculiar shooting pains along the nerve just as if it had been knocked at the elbow. These sensations were specially marked when she tried to lift anything. These were the only signs of the disease, and otherwise the patient seemed to be enjoying excellent health.

Dr. MacLeod decided to treat the case by nastin injections. The injection of 1 c.c. of nastin B1 were begun in March, 1909, and were given subcutaneously into the thighs. There was no definite pain associated with the injection, and there was neither a local nor a general reaction. The treatment was continued for five months, but in spite of it the patches appeared to be increasing in size, and the patient complained of numbness of the little finger, which was a new symptom. Consequently injections of nastin B2 were

substituted, but with no more definitely beneficial results. The nastin treatment was continued until July, 1911, and as there had been no marked change for the better it was decided to replace it by injections of a leprolin, prepared by Dr. Bayon from a streptothrix which he had isolated from another case, and which he believed to be the specific micro-organism of the disease. These injections have been continued intermittently since then. Only in one or two instances has there been any reaction from them, and then it was simply in the nature of a slight febrile disturbance, which took place about eight hours after they were given. Recently the disease has remained stationary, and the patches have faded to such an extent that it is difficult to see them on casual observation.

Dr. MacLeod showed the case on account of the difficulties which may be met with in the diagnosis of early maculo-anæsthetic lesions, and also from the interest connected with the fact that the patient, while under nastin treatment, remained *in statu quo*, but since Bayon's leprolin had been injected had shown decided improvement. In a disease, however, which is prone to exacerbations and remissions apart from treatment, Dr. MacLeod thinks it is impossible to come to any conclusion from an isolated case with regard to the merits of any individual form of treatment.

SHANGHAI MUNICIPAL COUNCIL HEALTH DEPARTMENT ANNUAL REPORT, 1911.

By Arthur Stanley M.D., D.P.H.

Dr. Stanley, in his introductory remarks to his report, states that: "China is the fountain-head of epidemic disease and, in the general absence of modern hygienic methods, remains a danger to the world. China holds more than a quarter of the population of the world, and this massing of the people has led to cumulative propagation of infective disease. The resulting destruction of life has been met by rapid reproduction, the birth-rate being probably much higher than in Europe, though there is no book-keeping of Chinese humanity to confirm the statement. The pandemics of plague, cholera and influenza had their origin in China. It is interesting to note that what is known in Western Europe as 'Russian influenza' is known in Russia as 'Chinese influenza.' Shanghai is under the morbid influence of China, and at the same time in close touch with the Occident. Scarlet fever, for example, has been introduced from the West, while yellow fever and rheumatic fever are waiting at the door. Especially will it be necessary to be on guard against yellow fever when the Panama Canal is opened. In the presence of these dangers which envelop Shanghai, it is gratifying to be able to record a satisfactory state of the public health during the year.

"The death-rate among the resident foreign community has been lower than for six years, namely, 16·8 per thousand, a figure which compares favourably with that of many European cities.

"The position as regards plague remains the most important one with which the Health Office has had to deal. In the beginning of the year the local plague state was overshadowed by the remarkable epidemic of plague in Manchuria. This epidemic was entirely pneumonic in character, the most virulent form of plague, spreading from person to person without any association with rats and fleas; and in this respect being unlike any other recent manifestation of the disease. The epidemic began in October, 1910, among Chinese trappers of tarabagan, a species of marmot, whose fur is used to imitate marten and sable. In January and February of the year under review it reached its full maximum, and in March subsided rapidly and simultaneously, both in places where preventive measures were taken and in places where no such measures were employed. Packed in railway carriages and in overcrowded heat-tight inns, about half the hundred thousand Chinese coolies who were returning to their homes contracted plague. Practically no cases recovered. That the cases were all pneumonic was clearly explained by the ease with which one case can spread the disease to others in close proximity. The best protection, when in the vicinity of pneumonic plague cases, was found to be the wearing of a mask consisting of a cotton wool pad over the nose and mouth. Owing to the unusual danger caused by the spread of the disease, the Chinese Government convened an International Plague Conference at Mukden, to which the present writer (Dr. Stanley) was summoned.

"Although rats played no part in the Manchurian epidemic of pneumonic plague, the character of the outbreak was so unlike any other manifestation of the disease during the present pandemic that it afforded no reason for any alteration in the plan of plague prevention in Shanghai. This has been directed entirely against the rat as the primary cause; man, under ordinary circumstances, playing practically no part in the spread of plague. Plague actually exists among rats in Shanghai and there have already been five limited outbreaks where the disease has been communicated to man. Were pneumonic plague to come it could be met by isolation, segregation of contacts and the wearing of masks. But the more insidious, though somewhat less deadly, bubonic plague, propagated by rats, requires constant vigilance and continuous application of preventive measures. The Manchurian epidemic showed how wasteful is the expenditure and poor the result of preventive measures organized in the excitement of an epidemic. It is during the succeeding yearly lulls that the best results are to be obtained by careful and well-thought-out organization of preventive measures.

"During the year under review, the full plan of campaign against plague previously decided upon has been continued, special attention being given to permanent rat-proofing. It is generally held that the danger to man from plague is directly dependent on the accessibility of the interior of dwellings to rats. In that part of the Settlement where rat infection has been concentrated, owing, it is believed, to its proximity to the insanitary Chapei district, a large number of Chinese houses have been permanently rat-proofed by laying a solid ground floor

PLATE I.

FIG. 1.—Calf B^1 inoculated with eleventh day lymph from vesicles on calf B in 2nd set of series A.

FIG. 2. — Ibrahim, showing vaccine vesicles produced with lymph from a child three removes from calf B^1 in 2nd set of series A.

FIG. 3 — Mungur child A, vaccinated in 1st set of series B.

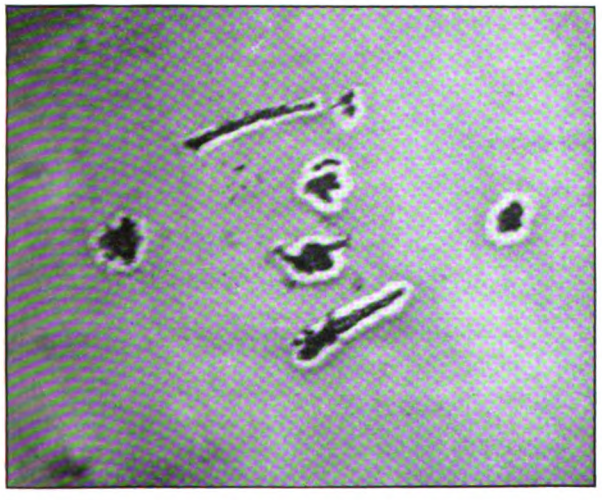

FIG. 4.—Vesicles of ninth day on calf E^2 inoculated from calf E, which was inoculated February 9, 1895, with a culture 24 hours old of R.P., *i.e.* from microbe isolated from buffalo on September 14, 1894. 2nd set, series B.

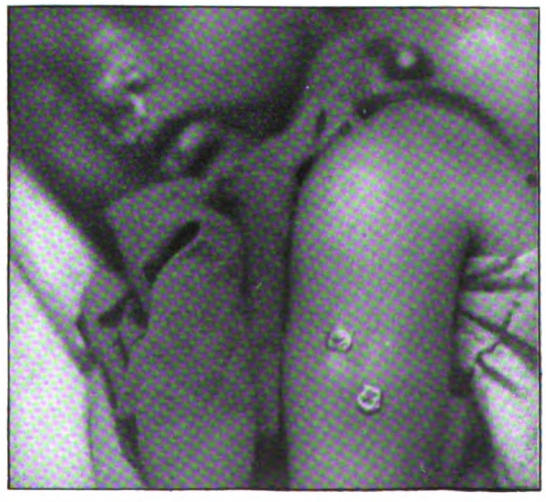

FIG. 5.—Punia. One of the children vaccinated from calf E^2. 2nd set, series B.

To illustrate "The Etiology of Vaccinia." By Professor W. J. SIMPSON.

PLATE II.

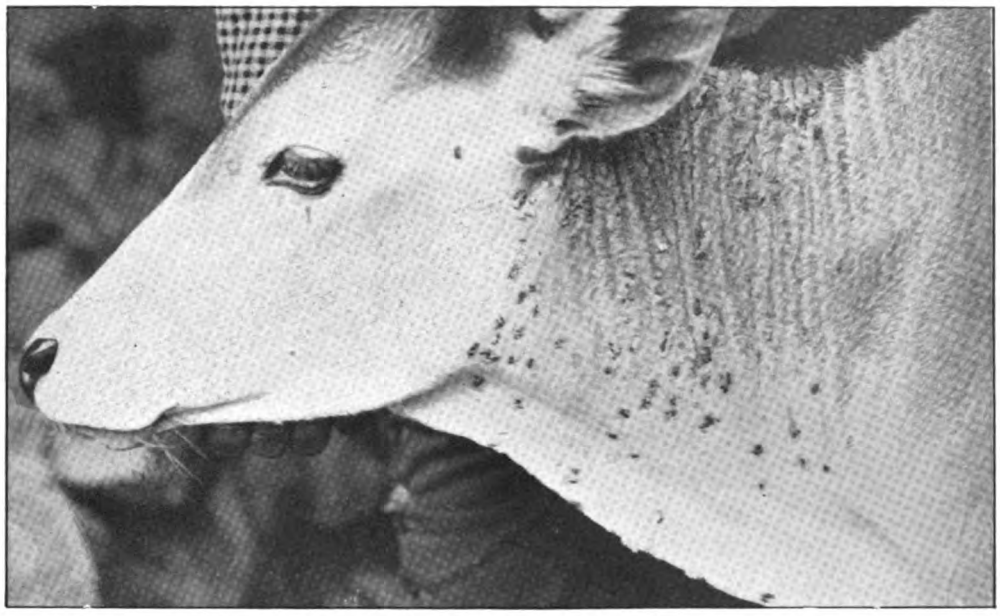

FIG. 6.—Calf F, with eruption left side of neck. Series C.

FIG. 7.—Calf F, with eruption on throat and dewlap. Series C.

To illustrate "The Etiology of Vaccinia." By Professor W. J. SIMPSON.

PLATE III.

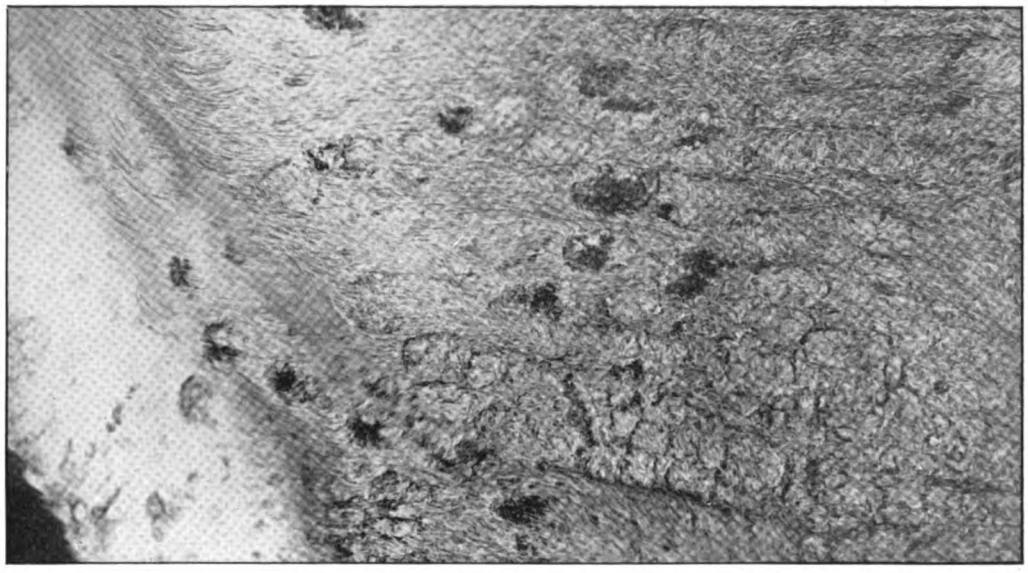

FIG. 8.—Calf F, with eruption on portion of right side and neck. Series C.

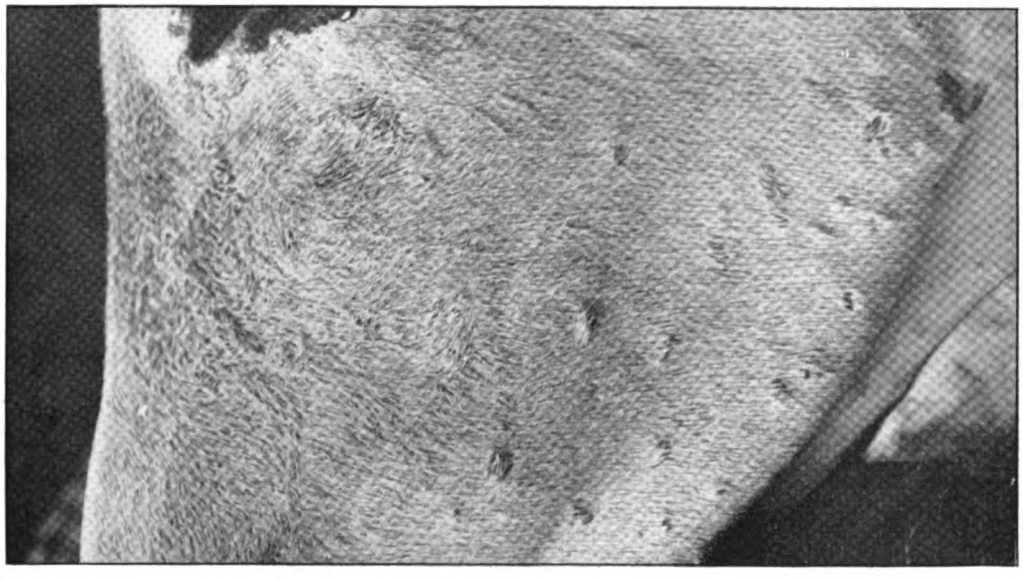

FIG. 9.—Calf F, with eruption on right side of face. Series C.

To illustrate "The Etiology of Vaccinia." By Professor W. J. SIMPSON.

PLATE IV. To illustrate "The Etiology of Vaccinia." By Professor W. J. Simpson.

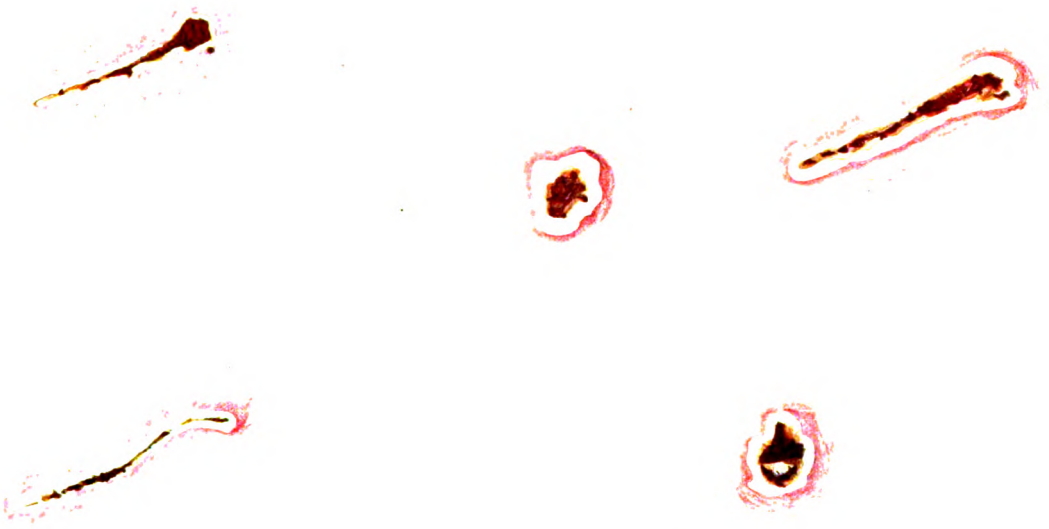

Fig. 4, 2nd Set, Series B.—Calf E2, 118 hours, Feb. 24, 1895. From Calf E, inoculated Feb. 9, with Y culture, R.P.

Fig. 4, 2nd Set, Series B.—Calf E2, 193 hours, Feb. 27, 1895.

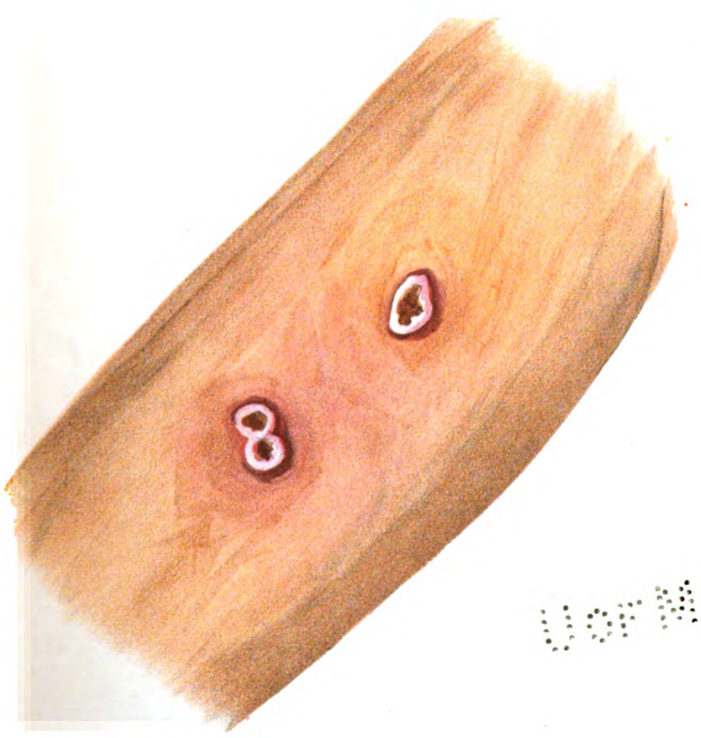

Fig. 3, 1st Set, Series B.—Mungur child A. Left Arm, vaccinated Feb. 25, from Calf D', 144 hours. Drawn March 3.

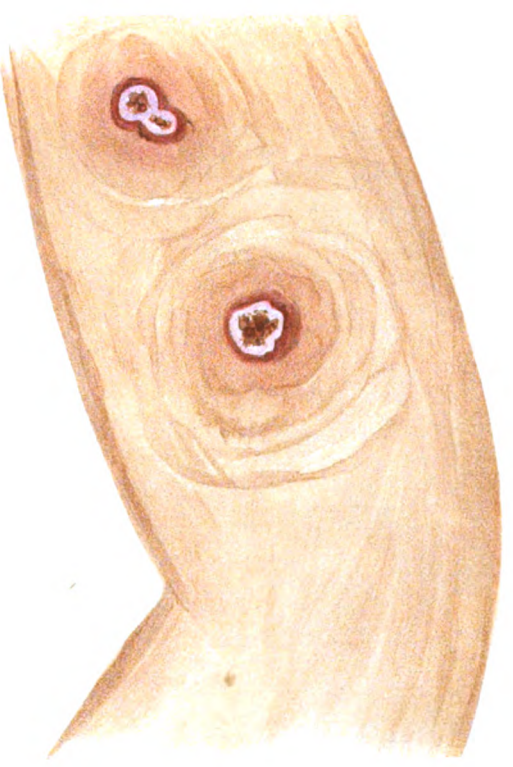

Fig. 5, 2nd Set, Series B.—Child Punia. Vaccinated from Calf E2, on Feb. 23. Drawn Feb. 28, 1895, 3.30, 118 hours.

and, where necessary, removing ceilings and other hollow spaces accessible to rats. It is held that the permanent eradication of plague is directly dependent upon the amount and permanence of the rat-proofing done. Already in the part of the Settlement where most rat-proofing has been done it has been possible to reduce the ordinary plague prevention staff.

"The Chapei district has a population estimated at upwards of 50,000, mostly of the very poorest class, living in bamboo and mud hovels under conditions of almost indescribable filth. There is no line of separation between this insanitary area and the Settlement. The source of livelihood of these poor wretches can only be found within Settlement limits, so that the whole neighbourhood may be described as a parasitic growth of a peculiarly malignant type on the body of the Settlement that cannot, at present, be either removed or cured.

"In order to make clear what are the proper functions of the Health Office, especially to the many who have the idea that these are chiefly concerned with the removal of smells, the following is a short statement of the main duties of a health officer as expected to-day:—

"(1) To carefully and constantly study the cause of disease. In order to do this he should have readily available records of the general sanitary condition of every section of the place. He should receive from each practising physician an immediate report of every case of infectious disease, and should encourage such reports by furnishing every aid to diagnosis that a well-equipped bacteriological laboratory will afford.

"(2) To recommend measures of disease prevention and to see that obedience to such regulations is enforced.

"(3) To keep the public informed as to the prevalence of disease and educate them in measures necessary for their protection. It is rare to find even well-educated people with an adequate knowledge of the most elementary principles of the prevention of disease.

"Curative medicine, implying treatment, appeals more directl y to human sympathy, and large funds are readily obtainable for its application.

"Preventive medicine entails self-restraint and sacrifice, looks to the future rather than the present, and appeals to the intelligence rather than to the emotions. It cannot be said to be popular. The majority of people still have supreme confidence in a prescription or a bottle of medicine or tabloids, and advice, that an alteration in the mode of life and greater restraint are necessary and sufficient, without medicine, is seldom valued at its proper figure."

Dr. Stanley goes on to say that the following public health measures are needed in Shanghai:—

"The application of measures for excluding rats from dwellings throughout the Settlement.

"Furthe ramendment of the Chinese Building Rules so as to secure as far as possible rat-proof houses.

"Amendment of the Foreign Building Rules so as to secure proper kitchen arrangements and, as far as possible, rat-proof houses.

"Extension of the Health Office and Laboratory building.

"Completion of the Isolation Hospital to include isolated accommodation for cases of tuberculosis among foreigners.

"Further development of Health Offices in each sanitary sub-district, including an improved system of death registration.

"A separate residence for Municipal Nurses, and enlargement of the Nursing Home.

"Dispensaries for Chinese consumptives (in connection with the District Health Offices), a hospital for advanced cases and a sanatorium for curable cases of consumption.

"A new Land Regulation dealing with public health measures generally.

"Enlargement of the Hongkew Market and a Vaccination League among the Chinese."

Dr. Stanley has had the following Public Health Notice for foreigners published during the year. All laymen going to Shanghai would do well to study it carefully, as it is sensible and very much to the point. The notice, as circulated by Dr. Stanley, is as follows:—

"PUBLIC HEALTH NOTICE FOR FOREIGNERS.

"The following measures are recommended for the purpose of preventing those diseases which, by means of public sanitation and by individual careful living, are preventable, such as typhoid fever, cholera, dysentery, diarrhœa and other bowel disorders, small-pox, scarlet fever, diphtheria, tuberculosis, plague and malaria.

"*Public Measures.*

"Sanitary inspection of houses will be carried out free of charge on application to the Health Officer. Persons about to rent houses are advised to ask the Health Officer for a sanitary inspection and a certificate of good sanitation before closing with the landlord.

"Conditions dangerous to health should be reported to the Health Officer.

"Isolation of cases of dangerous infectious disease is provided at the Isolation Hospital, Range Road.

"Disinfection of premises after infectious disease will be carried out free of charge on application to the Health Officer.

"*Individual Measures.*

"Eat and drink nothing that has not been recently cooked, boiled or otherwise sterilized.

"Do not consume:—

"*Fruit, vegetables, salads, melons, &c., which have not been cooked or sterilized.

"Food on which flies have settled.

"*Milk or cream which has not been boiled or sterilized.

"*Water which has not been boiled or filtered through a Berkefeld filter.

* "Fruit, tomatoes, melons, &c., can be sterilized so that they can be safely eaten raw, and without spoiling the flavour, by dipping for a few seconds into briskly boiling water. Strawberries are better sterilized by dipping into boiling sugar syrup. Milk and cream can be sterilized by placing the bottles in a pan of cold water and gradually raising to boiling point. The candle of the Berkefeld filter should be lightly scrubbed in running water and then boiled once a week regularly."

"Aerated waters and other drinks unless of best quality.

"Alcoholic drinks during the hot weather.

"Ice-cream, unless made of boiled materials.

"Uncooked oysters.

"Fish, from June to October.

"Kitchen supervision should be thorough because the preventable diseases specially prevalent in Shanghai are mostly caused by infected food. Every house should have a serving-room adjoining the dining-room and separate from the kitchen. The serving-room should contain the Berkefeld filter, ice-chest, table utensils, washing sink, boiled milk, drinks, bread, butter, fruit and other cooked or prepared foods. Cooking or boiling destroys infection.

"Vegetables and fruit grown near the ground, being watered as a rule with nightsoil, are specially liable to be soiled with the germs of typhoid fever, cholera, dysentery and other bowel diseases, and should, before cooking, be strictly kept out of the serving-room and from contact with cooked or prepared food.

"Flies carry disease, so they should be excluded from the serving-room, kitchen and servants' latrine by providing spring doors and unopenable windows screened by perforated zinc, and from the food on the table by fly covers.

"Vaccination should be done on arrival in Shanghai and afterwards every three years.

"Keep rats out of your house. Starve the rats by providing no food for them in and around your house. Keep cats. Make your house rat-proof.

"Mosquitoes carry malaria. Where mosquitoes cannot be exterminated by abolishing stagnant water or by the use of kerosene oil, or by reporting their presence to the Health Officer, the mosquito net should be carefully used. A weekly inspection should be made and no standing water permitted.

"Refuse should not be allowed to accumulate, and a properly covered, easily lifted galvanized iron receptacle should be provided. Nightsoil buckets should be kept securely closed, including those in the servants' latrines. Proper receptacles for these purposes may be obtained at the Health Office. Yards and drains should be kept in a good state of repair and freely flushed with water."

The report also contains much useful information about infectious diseases, sanitary inspection and hospitals.

Abstracts.

VILLAGE SANITATION IN BRITISH GUIANA.

By A. T. Ozzard, M.R.C.S., L.R.C.P.*

At the present time almost all tropical countries are putting their houses in order on the lines of up-to-date scientific knowledge; and the country that lags behind in this respect must be looked upon as retrogressive.

It is therefore a matter of congratulation that British Guiana is at least trying to keep itself up-to-date, somewhat slowly, without doubt, but in the face of tremendous odds, owing, mainly, to a sad lack of funds, and a considerable amount of opposition from some who ought to know better.

With the quite recent passing by the Legislature of the Mosquito Ordinance, we at least possess a powerful piece of machinery to place this colony on an equal footing to that of the most up-to-date tropical countries. Whether we shall succeed in doing so remains to be seen.

The object of these short notes is to describe as clearly as possible the true condition of affairs in our villages with regard to sanitary matters, and to point out how much can be done to remedy their defects.

The three chief points which require to be touched upon, are: the water supply, the disposal of fæcal matter, and drainage.

Water Supply.

At the present day most of our villages are absolutely without a proper supply of good water.

The majority of the villagers obtain their drinking water either from death traps, in the form of barrels or small tanks, or from what are ironically called "sweet-water canals"!

These latter are open canals or trenches, quite unprotected from all kinds of fouling by human beings and animals.

The large number of bowel complaints so prevalent in most of our villages need, therefore, cause no surprise.

The remedy for this condition of things is obviously to abolish these water-barrels on account, of course, of their being such dangerous breeding resorts for mosquitoes, and also to abolish the "sweet" water trenches; and erect in their stead properly constructed tanks or vats.

As a matter of fact the Local Government Ordinance practically makes provision for such vats or tanks.

Section 179, paragraph 1 of this Ordinance reads: "The owner of every building in any district other than a plantation, and the owner of every plantation, shall erect and maintain in good order a tank or tanks for the storage of rain-water, and capable of storing the quantity of water prescribed under the provisions of this Ordinance and in this Ordinance referred to as the prescribed quantity."

Paragraph 4 of this same section reads: "Every Local Authority may make bye-laws for the cleansing and rendering mosquito-proof of tanks, vats and other receptacles for the storage of water, and in such bye-laws may prescribe the means by which such tanks, vats and receptacles shall be made and kept mosquito-proof."

Section 181, paragraph 1 reads: "It shall not be lawful, except with the permission of the Board, for any person having the control of any school-house, or of any building built for the purposes of public entertainment, to permit the same to be used, unless: (*a*) A tank has been erected with a capacity to contain ten thousand gallons of water, or four gallons for every square foot of horizontal area covered by the roof,

* From the *British Guiana Medical Annual*, 1910.

whichever shall be the smaller quantity; and (*b*) such tank has been connected with such school or building by proper gutters and pipes, of sufficient size to receive all the rain falling on the roof and to convey the same to such tank."

Paragraph 2 reads: "Every person who acts in contravention of this section shall be liable to a penalty not exceeding one hundred dollars."

How many school-houses in country districts have such tanks? I cannot remember to have come across any!

With regard to dwelling-houses, in the 4th schedule appended to this Ordinance, the following prescribed quantities are given:—

Dwelling-houses of more than one storey and of value of $500 or more, 1,500 imperial gallons.

Dwelling-houses of one storey and of less value than $500, for each room 100 imperial gallons.

Where rooms occupied by different families, for each room so occupied, 100 imperial gallons.

In addition to these regulations, the Local Authority may, and shall, when required by the Board, construct and maintain tanks and reservoirs for the storage of rain or fresh water, and may sell the water or permit the free use thereof—they may attach gutters to roofs of churches, &c., schools or buildings used for public entertainment, to collect water for their tanks unless there is a tank connected with such church, &c., of a size to contain five gallons of water for every square foot of the area covered by the roof.

Here, then, one would think that we have practically all the means at our disposal for the ensuring of a proper supply of pure water for our villages. And yet how many of these villages possess anything at all of this description? I know of none.

Surely it is time for us to wake up from our lethargy and carry out the intention of this comprehensive Local Government Ordinance. Bowel complaints, unfortunately, figure very largely in our mortality returns; and I think I am right in saying that the majority of such cases are supplied by the villages of British Guiana.

We have the means of insisting on every dwelling-house being provided with a certain amount of water, and we have the means for insisting on the water receptacles being safeguarded against mosquitoes.

Doubtless villages may want to know where the money is to come from to provide such tanks referred to. The Government, recently, has been very liberal in voting a large sum of money for such and similar kinds of work. By applications to the Local Government Board an out-and-out grant-in-aid or a loan of money can be obtained. I have been fortunate in obtaining such a grant-in-aid for one village, and hope to be able to get yet more.

It therefore seems to me that the solution of the water difficulty, so far as the villages are concerned, lies entirely in our own hands. All we have to do is to put the Local Government Ordinance into action!

Disposal of Fæcal Matter.

Here again the Ordinance comes to our help. Sections 188-194 give power to enforce provision of privy accommodation for houses and factories, &c., by written notice requiring the special work to be done within a prescribed time.

What are the conditions met with in our villages at the present day? A large number of the inhabitants have no privies to resort to; and consequently they defæcate wherever they think fit, as often as not close to a so-called "sweet-water canal"! The few privies that do exist are in the very large majority of cases absolutely insanitary.

The usual type is that of a tumble-down sort of shanty with or without a seat, and placed in any haphazard spot, irrespective of close proximity to dwelling-houses, and in many cases without even a pit dug to receive the deposits! One can easily imagine the state of the ground around in the rainy seasons. And one can readily understand how easily ankylostomiasis is spread by such insanitary conditions.

The owners of sugar estates in the colony have been compelled to erect proper latrines, and in sufficient numbers for the labourers they employ; and they may well grumble if their village neighbours are allowed to be a source of infection to their labourers, by the negligence and utter callousness of the neighbouring villages.

Local authorities, therefore, should enact bye-laws for the erection of latrines on similar lines to those now in use on most of the estates in the colony.

Almost every village in the colony is intersected by trenches opening into main drains, over which trenches suitable latrines can be placed. The outlay would not be excessive, and they would of course be under the control of the Authority, who would have in their employ a scavenger, whose duty it would be to keep the latrines clean.

If these comparatively simple steps were taken by the villagers at large, ankylostomiasis and other bowel complaints would be very considerably diminished.

I feel convinced that this can and ought to be done in the same way as the Medical Department has made the estates carry out this reform.

Drainage.

The law requires every Authority to maintain proper drainage. They must keep all trenches and main drains clean.

Every owner of a lot is obliged to effectually drain his lot and for this purpose:—

(1) He must make such dams and drains as may be necessary.

(2) He must fill up all irregularities in the surface of his lot and adjust the same, and if necessary raise the level to drain the water off and prevent a swamp.

With the consent of the Authority the owner may have a pond on his lot. It should be the Authority's duty to see that any such ponds are not allowed to become breeding-grounds for mosquitoes.

As a rule sufficient pressure is not put upon lot-holders by the various Authorities compelling them to keep their drains in proper order.

With these short references to the Local Government Ordinance, I think I have shown that all

villages possess the necessary machinery to keep themselves in an up-to-date sanitary condition: and the present deplorable condition reflects very seriously on the various Authorities for not insisting on the many excellent provisions given them by the Local Government Board.

It has many times been remarked that this colony is noted for the number of laws it is in the habit of making. They become a matter of a few days' wonder, and are then allowed to sink into oblivion. This very same Local Government Ordinance has been on the law-books of the colony since July, 1907, and how many of our villages have as yet attempted to live up to it? It is useless to cry out and say we have not got the money to do all this. We have quite sufficient money to do the greater part of the absolutely necessary reforms which are needed, and we have a long-suffering Government to appeal to for loans, or even to give us grants-in-aid. It is not the money that is the obstacle: it is the sad lack of interest and initiative of the villagers themselves.

The following are the provisions of the Mosquito Ordinance:—

(1) The owner of any premises shall keep in good repair all tanks, vats, barrels, or other vessels used for storing water, and all gutters and water-pipes, and shall keep the same in such a condition as not to breed mosquitoes.

(2) The occupier of any premises shall keep his premises free of all bottles, tins, boxes, shells, or other receptacles of a like nature which may retain water and become the breeding-places of mosquitoes.

(3) The presence of mosquito larvæ in any collection of water, on any premises, shall be evidence that the provisions of the last two preceding sections have not been complied with, and the owner or occupier thereof as the case may be shall be liable to a penalty not exceeding twenty-four dollars.

(4) It shall be lawful for any person authorized in writing by the Surgeon-General to enter and inspect any premises at any time between eight in the morning and six in the evening, and any owner, occupier or other person in charge of such premises who shall refuse such admission, or obstruct or hinder or prevent any such person as aforesaid from making such entry or inspection, shall, on conviction thereof, be liable to a penalty not exceeding twenty-four dollars.

(5) Legal proceedings in respect of any breach of this Ordinance may be taken by any officer of the Local Authority of the district within which the premises are situated, or by any person authorized in writing by the Surgeon-General.

Curiously enough, this Ordinance has been called the Stegomyia Ordinance by a writer on "Nature Notes" in one of the local papers. This writer maintains that it will have no effect on the anopheles mosquito, nor indeed on any other mosquito than the stegomyia. He bases this very curious statement on the general rule—which rule, by the way, is as much honoured in the breach as in the observance—that the anopheles mosquito will only breed in marshes, and the stegomyia mosquito will only breed in vats or similar receptacles.

It is true that wide statements to this effect have been made by scientists. But it is a rule which must be interpreted in the widest sense. I have myself frequently found the larvæ of the anopheles breeding in the common water barrels found alongside villagers' houses. Indeed, I hardly ever look into one of these barrels without seeing a fair number of anopheles larvæ. I have also found these anopheles larvæ in a small shallow puddle, only a few inches in diameter, amongst a sweet potato cultivation within a few feet of a dwelling-house.

Dr. Bentley, of Bombay, found that the anopheles mosquito responsible for malarial fever in that city breeds chiefly in tubs and barrels.

A much more practical rule than the above would be that in whatever house anopheles mosquitoes are found, they must have their breeding-grounds on the premises somewhere, or within a very few yards of that house.

It should not be such a very difficult task to rid our villages of mosquitoes, at any rate, to a very large extent. The first thing to be done is to get rid altogether of the tubs and barrels, or to ensure that any such are properly screened. Small fish are undoubtedly a help: but I have not found them entirely satisfactory.

Mosquito brigades should be established in each village, consisting of the chairman or other member of the Authority, the village overseer, and one or two shirt-tail boys.

This brigade should go the round of the village once a week, and inspect all the yards and surroundings. Any persons having barrels or other receptacles containing mosquito larvæ should be cautioned, and if found absolutely obdurate, should be prosecuted under the Mosquito Ordinance.

Every opportunity should be given them to fall into line; but an end must be put to the breeding of mosquitoes in the vicinity of dwelling-houses.

Another matter which needs attention is the indiscriminate way in which burnt earth heaps are usually built. The earth is dug out and heaped up ready for burning without any means being taken to prevent the formation of "borrow-pits." Consequently, these "borrow-pits" become excellent breeding-places for mosquitoes. This could very easily be prevented by digging trenches opening into the main drains, and using the earth thus dug out for burning.

As these burnt earth heaps are so common about the villages, it becomes an important matter to see that they are so managed as to prevent the making of a lot of ponds for mosquitoes to breed in.

Another matter which is likely to engage the attention of the Legislature before long, is the question of rice cultivation in proximity to dwelling-houses. The local press has recently drawn attention to the increase of malarial fevers corresponding to the increased area of rice now under cultivation. For many years past, Italy and other countries have had laws in existence preventing the cultivation of rice within certain distances of dwelling-houses. There can be no doubt as to rice-fields affording excellent breeding-places for the anopheles mosquito: and I have satisfied

myself that our rice-fields are no exception to this rule.

In conclusion, Dr. Ozzard thinks that he has shown that British Guiana possesses the machinery for up-to-date sanitation in its villages, and everything depends on the village authorities themselves, as to whether they intend to improve their sanitary conditions or whether they prefer to continue wallowing in the mire.

A NEW AND EFFICIENT METHOD OF CULTIVATING *BACILLUS LEPRÆ* FROM THE TISSUES, WITH OBSERVATIONS ON THE DIFFERENT STRAINS OF ACID-FAST BACILLI FOUND IN LEPROUS LESIONS.*

By Charles W. Duval, M.D., and Creighton Wellman, M.D.
New Orleans.

THE authors state that in a previous communication one of them (Duval) showed that the initial multiplication *in vitro* of the bacillus found in leprosy lesions is attended with considerable difficulty unless bits of the infected tissue are transferred to the culture-medium and special methods employed for the breaking down of the tissue protein. In other words, the removed tissue particles must be hydrolyzed before the contained acid-fast bacilli will multiply.

The difficulty in continuing the multiplication in subcultures occurs as soon as the digested tissue material has been exhausted. Therefore it is absolutely essential to substitute at some period in the process a medium which contains split products of protein digestion, such as the amino-acids, until the culture has accustomed itself to more or less saprophytic conditions.

Early in the work on the cultivation of acid-fast bacilli from leprous lesions it was noted that, in the removed tissue bits which had become contaminated with putrefactive bacteria, the contained Hansen bacillus multiplied in great profusion whenever the extraneous germs digested or softened the tissue. Under these conditions multiplication occurred regardless of the character of the medium employed, and within a wide range of temperature.

This observation led to a study of the *rôle* played by such extraneous bacteria, which established the fact that the multiplication *in vitro* of the acid-fasts was the result of a hydrolytic action on the protein with the attendant appearance of dissociate products. These products of tryptic digestion supplied the necessary nutrient for the lepra bacillus.

Many of the necessary amino-acids, however, are often difficult to obtain and to prepare into suitable mediums. In view of this fact various nutrients have been experimented with in the hope of finding an efficient medium which would be practicable for this purpose and readily accessible to all laboratories.

Whereas the "hydrolizing method" is thoroughly efficient in establishing the initial growth, and is possibly to be preferred where the specific organism is very scarce in the lesions, yet it entails the subsequent use of a special medium in order to obtain the pure Hansen culture. Therefore a medium which will recover the culture directly is certainly to be preferred under ordinary circumstances. Trypsinized egg-medium, which was formerly employed for this purpose, is of value, but not as certain in all cases as some of the other methods.

In the summer of 1911 one of the authors (Wellman) suggested the use of mammalian placental tissue extract as a nutrient that might be suitable for the purpose of cultivating *Bacillus lepræ* and allied species which apparently require the dissociate products of tryptic digestion, since the tissue named has been found to be rich in the amino-acids.

A medium was therefore prepared containing the untreated juice from human placenta in varying proportions and combinations, and its value was tested in the isolation and cultivation not only of *B. lepræ*, but of various highly specialized parasitic micro-organisms. So far the fluid extract of placenta alone or combined with glycerin-agar has served, in the authors' hands, as an admirable culture-medium for the isolation of *B. lepræ*, *B. tuberculosis* and the acid-fast organism of rat leprosy.

The medium is prepared as follows: The fresh human placenta is thoroughly macerated and ground up in a meat-chopper, after the blood is washed out by sterile saline run through the attached vessels. To every pound of placental tissue there is added 0·5 litre of sterile salt solution. This mixture is now allowed to infuse for forty-eight hours at refrigerator temperature, when it is filtered through a previously tested No. N Berkefeld filter for purposes of sterilization. To facilitate the filtration the cylinder of the Berkefeld filter is filled with clean, fine sterile sand until the candle is completely submerged. The clear amber-coloured filtrate is then tubed or added to a 2 per cent. sterile agar which has been previously melted and cooled to about 41° C. The placental juice and the agar are then thoroughly mixed and the mixture sloped. The addition of 3 per cent. glycerine possibly enhances its nutritive value.

With placental extract either in the form of a liquid medium or of glycerinated agar the acid-fast bacilli in the removed and macerated tissue bits from human or rat leprosy multiply to such an extent that in from five to seven days the growth is distinctly visible to the naked eye.

Not only the initial culture, but subsequent transplants, in the case of *B. lepræ*, flourish on this medium. The growth is profuse and moist and without pigment in some cultures, while others are distinctly chromogenic. The chromogens subsequently will grow on the ordinary laboratory media, while the non-pigment producers refuse to multiply on anything but enriched special media.

The authors next go on to say that it is not the purpose of their paper to discuss or attempt to prove which of these types of cultures are or are not the

* From the *Journal of the American Medical Association*, vol. lviii, No. 19, May 11, 1912.

causal agent in leprosy. Suffice it to say that the acid-fast bacilli seen in the human and rat leprous lesion can in all cases be cultivated where the special method above outlined is employed.

It is, however, of interest in this connection to point out what may be designated as a period of absolute parasitism, which seems to persist for some strains of acid-fast cultures recovered from leprous lesions. The authors have cultures which do not, thus far, exercise saprophytic growth function, although many generations removed from the parent stem. On the other hand, there are among their cultures strains which at first grow slowly and only on special media, but which become more or less saprophytic after repeated subculturing over a period of months.

This decided difference in biological features inevitably brings up the questions of their relationship to one another and of their etiological significance. Are there in the leprous lesion two or more distinct species, or does the apparent difference merely represent separate stages in the life-cycle of an extremely pleomorphic organism?

On account of the unreliability of serologic tests for the group of bacteria possessing a fatty or lipoid body (which holds for all the known species in this group) and on account of the difficulty in producing experimental lesions with the particular organisms under discussion, this problem is rendered difficult of solution.

In the hope of throwing further light on this important question, however, the authors have undertaken a careful biological study of representatives of the two types of leprosy organisms above mentioned. The results of this study will form the subject of a subsequent communication.

Correspondence.

CORRESPONDENTS write from time to time asking about numbers of the Scientific Memoirs by Officers of the Medical and Sanitary Departments of the Government of India. They also ask if lists of these publications exist. The following list, taken from the last number of these Memoirs (No. 50), will supply the want and be generally useful to others as well.

List of numbers of Scientific Memoirs by Officers of the Medical and Sanitary Departments of the Government of India (New Series) published up to the present time June, 1912.

No. 1.—"Standardization of Calmette's Anti-Venomous Serum with Pure Cobra Venom: the Deterioration of this Serum through keeping in India," by Captain G. Lamb, I.M.S., and Wm. Hanna, Esq., M.B. Price As. 3 or 4d.

No. 2.—"Malaria in India," by Captain S. P. James, I.M.S. Price Re. 1-8 or 2s. 3d.

No. 3.—"Some Observations on the Poison of Russell's Viper (*Daboia Russellii*)," by Captain G. Lamb, I.M.S., and Wm. Hanna, Esq., M.B. Price As. 5 or 6d.

No. 4.—"On the Action of the Venoms of the Cobra and of the Daboia on the Red Blood-corpuscles and on the Blood Plasma," by Captain G. Lamb, I.M.S. Price As. 8 or 9d.

No. 5.—"Specificity of Anti-Venomous Sera," by Captain G. Lamb, I.M.S. Price As. 3 or 4d.

No. 6.—"First Report on the Anti-Malarial Operations in Mian Mir, 1901-03," by Captain S. P. James, I.M.S. Price As. 12 or 1s. 2d.

No. 7.—"Some Observations on the Poison of the Banded Krait (*Bungarus fasciatus*)," by Captain G. Lamb, I.M.S. Price As. 8 or 9d.

No. 8.—"A Preliminary Report on a Parasite found in Patients suffering from Enlargement of the Spleen in India," by Lieutenant S. R. Christophers, I.M.S. Price Re. 1-8 or 2s. 3d.

No. 9.—"Second Report of the Anti-Malarial Operations at Mian Mir, 1901-03," by Lieutenant S. R. Christophers, I.M.S. Price As. 10 or 1s.

No. 10.—"Specificity of Anti-Venomous Sera" (Second Communication), by Captain G. Lamb, I.M.S. Price As. 8 or 9d.

No. 11.—"On a Parasite found in Persons suffering from Enlargement of the Spleen in India,"—Second Report, by Lieutenant S. R. Christophers, I.M.S. Price Rs. 2 or 3s.

No. 12.—"On the Morphology, Teratology, and Diclinism of the Flowers of Cannabis," by Major D. Prain, I.M.S. Price As. 14 or 1s. 4d.

No. 13.—"Oriental or Delhi Sore," by Captain S. P. James, I.M.S. Price As. 10 or 1s.

No. 14.—"On a Parasite found in the White Corpuscles of the Blood of Dogs," by Captain S. P. James, I.M.S. Price As. 10 or 1s.

No. 15.—"On a Parasite found in Persons suffering from Enlargement of the Spleen in India,"—Third Report, by Lieutenant S. R. Christophers, I.M.S. Price As. 10 or 1s.

No. 16.—"The Specificity of Anti-Venomous Sera with Special Reference to a Serum prepared with the Venom of the *Daboia Russellii*," by Captain G. Lamb, I.M.S. Price As. 6 or 7d.

No. 17.—"Snake-Venoms in Relation to Hæmolysis," by Captain G. Lamb, I.M.S. Price As. 6 or 7d.

No. 18.—"*Hæmogregarina gerbilli*," by Lieutenant S. R. Christophers, M.B., I.M.S. Price As. 10 or 1s.

No. 19.—"On Kala-azar, Malaria and Malarial Cachexia," by Captain S. P. James, M.B., I.M.S. Price Re. 1-4 or 1s. 1id.

No. 20.—"Serum-Therapy of Plague in India"; Reports by Mr. W. M. Haffkine, C.I.E., and various Officers of the Plague Research Laboratory, Bombay; by Lieutenant-Colonel W. B. Bannerman, M.D., B.Sc., F.R.C.S., I.M.S. Price As. 14 or 1s. 4d.

No. 21.—"On the Standardization of Anti-Typhoid Vaccine," by Captain George Lamb, M.D., I.M.S. (Director, Pasteur Institute of India), and Captain W. B. C. Forster, M.B., D.P.H., I.M.S. Price As. 6 or 7d.

No. 22.—"Mediterranean Fever in India: Isolation of the *Micrococcus melitensis*," by Captain George Lamb, M.D., I.M.S., and Assistant Surgeon M. Kesava Pai, M.B., C.M. (Madras). Price As. 10 or 1s.

No. 23.—"The Anatomy and Histology of Ticks," by Captain S. R. Christophers, M.B., I.M.S. Price Rs. 3 or 4s. 6d.

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No. 29.—"*Piroplasma canis* and its Cycle in the Tick," by Captain S. R. Christophers, M.B., I.M.S. Price Rs. 2 or 3s.

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Captain Anderson McKendrick, M.B., I.M.S. Price As. 12 or 1s. 2d.

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No. 32.—"An Inquiry on Enteric Fever in India carried out at the Central Research Institute, Kasauli," under the direction of Lieutenant-Colonel D. Semple, M.D., and Captain E. D. W. Greig, M.D. Price Re. 1-2 or 1s. 9d.

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No. 49.—"Epidemic Dropsy in Calcutta," being the final report of an inquiry carried out by Major E. D. W. Greig, M.D., I.M.S.

No. 50.—"Preliminary Report on an Investigation into the Etiology of Oriental Soil in Cambay," by Captain W. S. Patton, M.B., I.M.S. Price As. 6 or 7d.

These Memoirs are published by and are on sale at the office of the Superintendent of Government Printing, India, Calcutta. Copies are also available from all agents for the sale of Government publications. Applications for back numbers should be made to this source therefore.

CAPTAIN A. G. MCKENDRICK, I.M.S., Secretary to the Central Committee for the Study of Malaria in India, sends the following

ERRATUM.

Paludism, No. 4.

For the table at the bottom of page 93, please substitute the following—

Quantity of Quinine sold by the State in Italy.

Year	1902	1,313.730	kilos.
,,	1903	4,166.855	,,
,,	1904	10,663.910	,,
,,	1905	16,348.877	,,
,,	1906	19,512.404	,,
,,	1907	22,214.616	,,
,,	1908	24,138.826	,,

Personal Notes.

INDIA OFFICE.

From May 18 to June 17.

Arrivals reported in London.—Lieutenant-Colonel H. W. Pilgrim, I.M.S., B.; Major R. F. Standage, I.M.S., B.; Captain W. S. Hamilton, I.M.S., B.; Captain R. T. Wells, I.M.S., B.; Captain F. W. Sumner, I.M.S., B.; Lieutenant-Colonel D. T. Lane, I.M.S., B.; Lieutenant-Colonel C. Duer, I.M.S.; Major C. H. Watson, I.M.S.; Major S. R. Christophers, I.M.S., B.; Captain A. J. V. Betts, I.M.S., Bo.

Extensions of Leave.—Major H. M. Earle, I.M.S., to July 27, 1912; Captain V. N. Whitamore, I.M.S., to July 13, 1912; Captain L. P. Brassey, I.M.S., 1 d.; Major C. B. Harrison, I.M.S., M., 6 m. M.C.

Permitted to Return.—Captain A. J. H. Russell, I.M.S.

LIST OF INDIAN CIVIL OFFICERS ON LEAVE (INCLUDING MILITARY OFFICERS UNDER CIVIL RULES).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Chaytor-White, Lieutenant-Colonel J., I.M.S., U.P., 33 m., March 26, 1910.

Gourlay, Captain C. A., I.M.S., E.B. & A., 18 m., April 7, 1911.

Gray, Lieutenant-Colonel W. H., I.M.S., U.P., 24 m., August 1, 1911.

Hamilton, Captain W. G., I.M.S., Bl. Gaols, 8 m., April 19, 1912.

Hugo, Major J. H., I.M.S., Central India (Foreign Dept.), 14 m. 18 d., March 17, 1912.

Lane, Lieutenant-Colonel D. T., I.M.S., Punj.

Long, Major W. C., I.M.S., M., 12 m., Nov. 1, 1911.

MacLeod, Major E. C., I.M.S., E.B. & A. Med., 9 m., March 12, 1912.

McPherson, Captain J., I.M.S., Res. Surg., Turkish Arabia, 18 m., April 17, 1911.

Morgan, Major E. J., I.M.S.

Pilgrim, Lieutenant-Colonel H. W., I.M.S., B. Hospitals, 18 m., April 15, 1912.

Scott-Moncrieff, Major W. E., I.M.S., N.W.F. Prov., 24 m., Nov. 19, 1911.

Standage, Major R. F., I.M.S.

Sumner, Captain F. W., I.M.S., U.P., 7 m., April 17, 1912.

Walter, Major A. E., I.M.S., Supt. X-ray Inst., Dehra Dun, 12 m., March 10, 1912.

Wells, Captain R. T., I.M.S., Plague Med. Officer, Jullundur.

Whitmore, Captain A., I.M.S., Burma, 12 m., Feb. 8, 1912.

Woolbert, Lieutenant-Colonel H. R., I.M.S.

LIST OF INDIAN MILITARY OFFICERS ON LEAVE.

Showing the Name, Regiment, or Department, and the Period for which the Leave was granted.

Browse, Major F. D., I.M.S.

Cleveland, Colonel H. F., I.M.S., 1 year, from Feb. 5, 1912.

Coppinger, Captain F. R., I.M.S., 1 year, from March 16, 1912.

Duer, Lieutenant-Colonel C., I.M.S.
Earle, Major H. M., I.M.S., to July 24, 1912.
Gill, Captain C. A., I.M.S.
Godkin, Major S. R., I.M.S., 8 m., from March 18, 1912.
Johnston, Lieutenant-Colonel C. A., I.M.S., 8 m., from April 8, 1912.
Sarkies, Lieutenant-Colonel C. J., I.M.S., 11 m. 11d., from Jan. 9, 1912.
Watson, Major C. H., I.M.S.
Whitamore, Captain V. N., I.M.S., to July 13, 1912.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"The Indian Medical Gazette," May, 1912.

Lamblia intestinalis and Diarrhœa.—Major Hooton, I.M.S., contributes an interesting note to the above number of the Indian Medical Gazette on *Lamblia intestinalis* and its possible connection with Poona diarrhœa. He quotes the history of a patient who suffered from diarrhœa, and in whose stools *Lamblia* were present. On treatment by β-naphthol, the diarrhœa and the parasites quickly disappeared. Major Hooton thinks that there was a close similarity between the case described and many of the so-called cases of Poona diarrhœa seen so commonly during the monsoon rains. On his return to that place, he found an acute case of the disease with *Lamblia* again present, and his suggestion that this supposed harmless parasite may be the cause of the trouble is one that requires further looking into.

"The Transvaal Medical Journal," vol. vii, No. 10, May, 1912.

Salvarsan and Optic Atrophy.—McNeil, Robb and Moll report a case of optic atrophy following the use of "606." It has generally been considered that this drug is free from this dangerous complication, but on reading the account of the case by the three authors mentioned above, it would seem that in rare cases such a disaster might occur. Critics may say that the atrophy was due to the syphilis and not to the drug, but to the fair-minded it would certainly seem as if it were the other way about.

"Journal of the Royal Army Medical Corps," vol. xviii, No. 6, June, 1912.

The Papataci Flies of the Maltese Islands.—Newstead states that there are altogether four distinct species of *Phlebotomus* now known to occur in the Maltese Islands. These are *P. papatasii*, Scop., *P. perniciosus*, n. sp., *P minutus*, Rond., which is rare, and *P. nigerrimus*, n. sp., discovered by Captain Marett, R.A.M.C. Newstead believes that *P. perniciosus* may have been used by those conducting the transmission experiments in Malta, and, although he has no direct proof, believes that the species may also act as a carrier of papataci fever.

"The Journal of Experimental Medicine," vol. xv, No. 6, June 1, 1912.

Malaria Pigment as a Factor in the Production of Malarial Rigors.—Brown believes that malarial pigment (hæmatin) plays a part in the production of the malarial paroxysm. He found that alkaline hematin in doses commensurate with the amounts of hematin liberated in the human circulation by the segmentation of the malarial parasite, produces, when injected intravenously into the rabbit, a paroxysm which is characterized by a short prodromal stage, a stage of chill and rising temperature, and a hot stage. In their details the phases of this paroxysm are practically identical with the corresponding ones in the paroxysm of human malaria.

He believes, therefore, that the phenomena in human beings infected with malaria are, at least in part, directly referable to the toxic action of this malarial pigment.

"Medical Record," vol. lxxxi, No. 22, June 1, 1912.

The Identity of Typhus Fever and Brill's Disease.—Brill, writing on the subject of the identity of typhus fever with the disease described by him and called after himself, states that the widely adopted conclusions of Anderson and Goldberger, which are supposed to prove the identity of the two diseases, are open to serious objections. Personally, he (Brill) believes that European typhus fever, Mexican typhus fever, and his own disease (Brill's disease) are related fevers which subsequent development along the line of acquisition of knowledge as to their infective agents will alone clear up. He believes that it is premature to speak conclusively about the identity of diseases with such marked differences as typhus fever and Brill's disease, before anything is definitely known about their causative agents.

"The Journal of the American Medical Association," vol. lviii, No. 23, June 8, 1912.

The Treatment of Ankylostomiasis.—Camillo Bozzolo, of Turin, Italy, contributes a paper to the above number of *The Journal of the American Medical Association* on "Notes on the Treatment of Ankylostoma Anæmia (Uncinariasis, Hookworm Disease) with Thymol." It is now over 30 years since Bozzolo adopted this treatment for ankylostomiasis, and it has remained more or less in the same form right down to the present day. Bozzolo believes that the dangers of administration of thymol in large doses have been exaggerated, and he can only recall one case where the drug possibly contributed in bringing about a fatal issue.

"The Journal of the American Medical Association," vol. lviii, No. 24, June 15, 1912.

Ankylostomiasis.—Glover draws attention to the prevalence of ankylostomiasis amongst Oriental immigrants coming to America. He states that attention has recently been directed to the introduction of the disease by aliens arriving at the port of San Francisco from the Orient, and that the infection has now been classed amongst the dangerous contagious diseases whose admission is prohibited. The parasite, either the *Ankylostoma duodenale* or the *Necator americanus*, is common amongst the Japanese, Chinese and Hindoos, the class of alien which chiefly comes to San Francisco. The author believes that the infection is specially prevalent in Japan and that the disease is more prevalent in the females than in the males. He points out the importance of the subject from the health point of view.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

SPECULATIONS ON THE LIFE-HISTORY OF *SCHISTOSOMUM HÆMATOBIUM*.

By Frank Milton.
Seamen's Hospital, Albert Docks, London, E.

That the zoologists seem for the moment to have set aside their inquiries into what happens to the bilharzia miracidium after it leaves the egg must be my excuse for speculating on an aspect of bilharziosis upon which I have no authority to speak.

The life-history of *Ankylostoma duodenale*, which is of paramount interest to the physician, has been worked out by Looss to its last ultimate moment, but *S. hæmatobium*, which is of particular interest to the surgeon, has been left in a state of comparative neglect.

Much has been explained to us as to the life-history of the mature fluke, and the effects to which it gives rise in the human body; the question how it gains access to the body of its host has been left unanswered.

Since for us this is the all-important question, in that we are conscious that when once the parasite has made its presence known we can do no more than try to alleviate the more distressing symptoms as they occur without any hope of freeing the host of his unwelcome guest, it would seem permissible for anyone to do what he can to raise the question again. I am fully aware of my unfitness to discuss a purely zoological question, but should this paper come under the notice of any of those to whom we are accustomed to look for help in zoology, and should the interest of one of these be fortunately aroused, if only by the absurdity of these speculations, and he be caused to re-open the subject, my purpose will have been attained.

Speaking as a surgeon, then, our knowledge of the life cycle of *S. hæmatobium* begins with the still sexually immature worms in the portal vein of man, it continues through the fully developed and sexually active parasites in the pelvic veins and tissues, and ends with the short period of separate life enjoyed by the miracidium hatched out in water after the extrusion of the eggs from the human body.

By analogy with the known life-history of other trematodes the cycle should be continued by the passage of the parasite through one or more intermediary hosts preparatory to its re-entry into its definitive host, man. But in spite of the efforts of many highly-trained observers no indication, however slight, has been so far obtained as to what does really happen to the parasite between the time it becomes a free miracidium and the time it is again found as a highly-organized worm in the deep structures of its definitive host.

The experiments which have been made with the object of finding out what becomes of the miracidium, and if and how it, or a development of it, can be introduced into the tissues of man, are innumerable, but all have had merely negative results.

Looss states that at the beginning of his many experiments he was convinced that the parasite entered the human body through the mouth and as a cercarium enclosed in the body of some small aquatic animal. In order to prove the possibility of this he tried to induce the miracidium to enter the bodies of molluscs found in Egypt, but failed to get any positive result. He at the same time examined the bodies of some hundreds of specimens of *all* the molluscs common in the Nile Valley without finding any spore cyst which might have been brought into relation with the bilharzia worms, and he has placed quantities of free swimming miracidia in contact with the same molluscs without obtaining any infection. The same negative results were obtained with the larvæ of insects, with fishes and with plants. Lortet, to quote one other observer only, relates having made many experiments upon the same lines, only to meet with the same negative results. He also tried to introduce the miracidia directly into a vertebrate host, but in the impossibility of making direct experiments upon man he, on the grounds that sheep are found in Sicily to be liable to infection with *Bilharzia crassa*, and seeing that the parasite is very nearly related to *S. hæmatobium*, used sheep in his first experiments. In making these experiments he caused the legs of certain sheep to be carefully shaven; he then had the skin lightly excoriated, and afterwards kept the animals for three months with their legs plunged in water containing many embryos of *S. hæmatobium*. On making *post-mortem* examinations upon these sheep no trace of the parasite could be found either in the bladder or in the portal or mesenteric veins, or in the excoriated tissues of the legs. He then injected water containing embryos and ripe eggs into the mesenteric veins of sheep, and a month later slaughtered these, but could find no evidence at the autopsies of any infection. He repeated these injection experiments on dogs, rabbits, and guinea-pigs, but with equally negative results. He then fed sheep, dogs, rabbits, and guinea-pigs on food containing large numbers of living embryos and eggs for a month—again with no results. He then placed living eggs and embryos in an aquarium containing many species of molluscs, and after a time mixed the water with the food of a calf, sheep, and a monkey, without result.

These and many similar experiments, made not only by the authorities mentioned but by many others over a long period of time, having all given absolutely negative results, it would seem reasonable to contend that the miricidia of *S. hæmatobium* do not pass into either a fresh-water mollusc or the larvæ of any commonly known insect, or into the fish, at any rate, of Egypt; nor can they be made to infect a vertebrate host by absorption through the stomach (Looss' experiment with acidulated water, not here referred to, has definitely settled this); nor will they, at any rate, under all conditions, penetrate the legs of sheep.

Experiments founded upon the known life-history of congeners of the parasite having failed in the hands of so many observers, it becomes necessary to

find some other basis on which to build. For this I think we may with advantage turn to the physical structure of the miracidium, and leave analogy for homology.

For this purpose it is as well to recall the usual mode of development of the digenetic trematodes to which *S. hæmatobium* is taken as belonging. Shortly summarized, this may be taken to be as follows:—

The mature fluke lodged in the definitive host produces large numbers of eggs which are extruded by this host. The eggs, after a period varying according to the particular worm concerned, hatch out and produce a miracidium. The miracidium, in turn, enters the first intermediary host, in the body of which it remains, whilst the germinal bodies contained in its abdominal cavity take on active development, and produce the next asexual generation, the cercarium. These cercaria are provided with glands known as the pyriform bodies which secrete a solvent fluid. When the cercaria are sufficiently developed, they make their way out of the body of this first intermediary host with the aid of this secretion, which is used to destroy the containing body. The cercaria, when fully developed, are found to contain certain cutaneous glands, from which the material for the formation of a cystic membrane is later on secreted. On regaining their freedom, the cercaria are either taken up by a second intermediary host, in which they become encysted, or else they become encysted upon the surface of some aquatic plant. The animal or plant bearing the cyst is then taken into the body of the definitive host (usually through the mouth), the capsule is dissolved, and the parasite becomes free in the tissues of this host to develop into the mature fluke.

The organs to which I wish to draw particular attention are:—

(1) The germinal cells in the miracidium, whose presence is an indication that this generation is to be succeeded by a new asexually developed organism.

(2) The pyriform bodies found in the cercaria, by means of the secretion of which the cercaria are enabled to effect their escape from the host in which they develop; and

(3) The cutaneous glands, also in the cercaria, the secretion from which forms the enclosing membrane for the penultimate or encysted stage of development.

An examination of the fully developed miracidium of *S. hæmatobium* shows a marked difference from the miracidium of, say the fasciolidæ, to which it is nearest in general structure, in that it contains not only germinal cells such as are found in fasciola, but it contains also the pyriform bodies which, in the case of fasciola are not developed until the next or cercarial stage is reached.

On the other hand, although the miracidium of *S. hæmatobium* possesses these pyriform bodies which in fasciola belong to the cercaria, they show no trace of those other characteristics of cercarial bodies, the cutaneous glands.

Now, seeing that the miracidum of *S. hæmatobium* contains an organ (the pyriform body) which is especially characteristic of the second stage of development of fasciolidæ, it would seem fair to argue that in the case of *S. hæmatobium* this second stage of development may be suppressed, and the miracidium may be taken to be the homologue of miracidium *and* the cercarium of fasciolidæ, and that actual cercaria may never be developed in *S. hæmatobium*.

If we grant this we find we have in the miracidium of *S. hæmatobium*, an organism ready to take on the penultimate stage as it occurs in fasciola, and in a state ready to become encysted preparatory to being taken up by the definitive host. But we are now met by the fact that the body with which we are dealing is not provided with even the rudiment of any gland capable of forming a cyst wall, and which therefore, presumably, can never become encysted.

On the other hand this same organism, owing to its being provided with germinal cells, must necessarily be on the way towards an asexual reproduction, and it is also provided with glands (the pyriform bodies) which, by homology, secrete a solvent fluid for which so far there is no apparent use. If the hypothesis we have so far gone upon is correct and the cercarial stage is suppressed, there will be no enclosing body to be dissolved by this secretion, and it would appear that the only alternative function for the fluid would be to exert a solvent action upon some structure by which entrance to, instead of exit from, some host is to be gained.

As I have implied in the beginning of this paper all my experience of *S. hæmatobium* has been in studying the effects caused by the presence of the parasite in man, and many things have tended to suggest to me the possibility that auto-reinfection may in certain cases have taken place, and in consequence an idea has been dimly formed in my mind that practically the whole life cycle of the parasite may, sometimes, be passed in man without the intervention of any intermediary host, and further the idea has long been fixed in my mind that infection, in all cases where infection is from without, takes place through the skin. If this is so it would seem to fit in with the conclusion towards which the hypothesis above formulated would seem to lead, namely, that the miracidium of *S. hæmatobium* does not enter any intermediary host but that it passes directly into the body of its definitive host, man, and that it is in his body that the germinal cells contained in the body of the miracidium develop and that the asexual as well as the sexual stage of the parasite is passed not of course as a rule in the same host, but in two hosts of the same species—that is to say that *S. hæmatobium* is monoxenous and not, as has been hitherto supposed, heteroxenous.

The possibility of direct infection by the miracidium has, of course, been broached by others, and Looss and Lortet have both made experiments in this direction; but although their attempts have hitherto not met with success, I think the reason may well be in the material with which they had to work being unsuitable.

Thus Looss chose monkeys from the fact that monkeys are known to harbour the parasite, but it may well be that monkeys are greatly more resistant to the attacks of the miracidia than man, and unless a very large number of experiments had been made it would be impossible to lay it down that direct infection in monkeys could not take place.

In the case of Lortet he appears to have based his experiments on the fact that sheep in Sicily are known to be extensively infected with *B. crassa*. But, I trust it may not appear to be disrespectful in me to say, unfortunately the experiments on sheep were made not with *B. crassa*, to which they were known to be susceptible, but with *S. hæmatobium*. This may possibly have made all the difference in the result of the experiments, for it is well known that though certain trematodes are known to inhabit hosts of widely different species, still these are the exceptions which go to prove the general rule that trematode endo-parasites are strictly confined to their own specific hosts, and that the exceptions to this rule are comparatively rare. And in support of this I think it should be noted in connection with this difficulty that whereas 75 per cent. of the cattle slaughtered in Catania are said to be infected with *B. crassa*, there does not appear to be any records of men living in this district being infected either with *B. crassa* or *S. hæmatobium*.

The apparent objection that if man is the unique host of *S. hæmatobium* there is no necessity for the eggs to be extruded, and thereby exposed to the many risks of destruction attendant upon a period of freedom, is in reality no objection, for it is a well-established law in parasitology that the young of endo-parasites never attain maturity within the host inhabited by the parent worms, but only after having gained access to fresh hosts. This rule is seen to be necessary, for were the millions of eggs produced by a few pairs of *S. hæmatobium* all developed in the same host the result must necessarily be rapidly fatal to the host and with him to the worms producing the eggs.

The further objection still remains that in no case has a parasite been found in man in the intermediary stage between the miracidium and the young immature worms found in the portal vein.

The objection is a negative one at best, and as far as I am aware, no great attention has been hitherto given to the search for this stage of the parasite in man. Remembering what amazing discoveries have been made in human parasitology within the few years embraced by the present century even, and noting how almost obvious some of these discoveries seem now, it is quite possible that the cercaria may have been almost under our eyes and yet not recognised. It would seem that if the cercarial stage is passed in man the most promising places to search for the early parasites would be either in the lymphatic glands of the groin or abdomen, or else in the spleen. The liver has in one way and another been pretty thoroughly ransacked in cases of bilharziosis in the search for lateral and terminal spined eggs, &c., and here nothing new is very likely to be found, but the spleen has not, I believe, been tested to any great extent, although its return blood goes directly into the portal vein, the habitat of the earliest known stage of the mature worm; and the lymphatic glands have, I believe, been only examined in a very perfunctory way.

Careful and repeated experiments upon cattle and sheep with *B. crassa* might give us definite results, but the crowning experiment to be desired is for a human being to offer himself as the subject of experiment, as has been so nobly done in malaria and ankylostomiasis.

MONGOLIAN BIRTH-MARKS

An Anthropological Study.

By Lawrence G. Fink, M.B., C.M.Edin.
Civil Surgeon Myaungmya, Burma.

(1) *Description by Herr Bealz of Blue Patches on the Skin of Mongolian Children.*—The description below by Herr Bealz is taken from his article on the "Races of East Asia, with special reference to Japan." The quotation was sent to me by Mr. C. Morgan Webb, I.C.S., Census Commissioner, Burma, in July, 1911, with a request to be furnished with information regarding any observations made by me on the presence of similar patches on the skin of children in Burma. Herr Bealz writes: "I now come to a test which is one of the most interesting in the whole of anthropology, viz., the patches on the skin of Mongolian children. Until I described them, eighteen years ago, these patches, strange to say, had never been considered, and, even now they appear to be unknown to most anthropologists. Every Chinese, every Korean, Japanese, and Malay is born with a dark blue patch of irregular shape in the lower sacral region. Sometimes it is equally divided on both sides, and sometimes not. Sometimes it is only the size of a shilling, and at other times nearly as large as the hand. In addition, there are also more or less similar patches on the trunk and limbs, but never on the face. Sometimes they are so numerous as to cover nearly half the surface of the body. Their appearance is as if the child had been bruised by a fall. These patches generally disappear in the first year of life, but sometimes they last for several years."

(2) *Observation regarding the Presence of Blue Patches on the Skin of Burman and Karen Children in the Myaungmya District, Burma.*—In the Myaungyma Town, out of 191 infants and children (varying in age from one month to three years), 181 were born with one or more blue patches, *i.e.*, 94·7 per cent. The patches occur as described by Herr Bealz. They are usually found in the lower dorsal and sacral region, are irregular in shape, and vary in size. I have seen them on all parts of the back, and they are not always strictly confined to the middle line. As a rule, the majority disappear within the first twelve months, but it is not uncommon to find them in children up to 3 or 4 years of age. I have also seen the marks on the sides of the chest,

abdomen, and over the shoulder blades, but never on the face. In the Myaungmya Jail a Burman, aged 31, had a dark blue birthmark over his left shoulder joint, showing the persistence of the patch for several years. Another adult Burman, aged 36, had a blue patch covering almost the entire left half of his abdomen, chest, and back, and extending along the inner and outer aspects of his left arm to his elbow joint. He stated that the site of the original birthmark, which was the size of the palm of his hand, was over the left side of his abdomen, and that during the past fifteen years or so it had gradually increased in size. If his statement can be relied on, this case is one of extreme rarity. There is still another Burman, aged 51, in the Jail who has his original birthmark, a dark patch over the entire left half of the abdomen, left side, and the corresponding portion of his back. The number of birthmarks that thus persist for years or for life is small in comparison with the number that disappear in infancy and early childhood. During my vaccination inspection tours in this district, I have examined a large number of children, and I am of opinion that from 90 to 95 per cent. of these have been born with the dark blue patches. The blue coloration shows better in the fairer skin of the Karens than in the brown skin of the Burmans. The patches are pigmentary, and not nævoid. One of my sub-assistant surgeons and his wife, natives of the Toungoo District, have four children, and all were born with patches, which disappeared within twelve months. Reverend Father Fagerton, a Roman Catholic priest, who has worked in this district for the past nine years, informs me that he has seen over 1,000 Karen infants, and he does not remember a single case in which a child was born without a patch. A child born to a European father and Talaing mother had a small blue patch on the back. A Eurasian married to a Karen woman has four children, and all were born with a patch. It would be interesting to know whether these patches would occur in subsequent generations in the case of the children of the European and Eurasian fathers. The mother in each case was the dominant factor, as the children were born not merely with patches, but also with Mongolian physical characteristics. The study of these characteristics and patches in such children is a problem in heredity which I must leave for the consideration of those qualified to deal with the subject. As these patches are not known amongst pure European children, their detection in North Italy, as has been reported by Consiglio, calls for explanation, and would rouse a suspicion of some Mongolian ancestor. These patches might hence be included amongst the other well-recognized characteristics of the Mongolian, and may afford a clue, when other physical characteristics are faintly marked or entirely absent.

(3) *Some Physical Characteristics of the Mongol.*—These have been well described in a recent editorial in the JOURNAL OF TROPICAL MEDICINE AND HYGIENE, April 15, 1912, pp. 120-1. They are briefly as follows: Slender bony frame, short stature, good muscular development (especially of calf muscles), delicate, hairless skin (scanty moustache, whiskers and beard), "obliquity of eyes" (due to a fold of skin on the inner side of the upper eyelid), flatness of the bridge of the nose, poor development of the air-cells in the frontal and nasal region and high-pitched voice. The face of a Mongolian is easily recognized by the flat nose, "obliquity of eyes" and scanty hair. The Mongols derive their name from a word "Mong," which means "brave," "bold." Apart from the Mongols proper, the Chinese, Japanese, Koreans, Burmese (including Shans, Chins and other tribes of Burma), Malays, Ghourkhas, Thibetans, Bhootans, &c., are included in the Mongolian family. It would be interesting to know to what extent the blue patches occur on the skin of children belonging to each of these races, and to trace in the history of each any circumstance that may account for the decrease or absence of this Mongolian characteristic.

(4) *The Tribes of Burma and certain Ethnological Considerations.*—There is much interesting reading on this subject in the chapter on Ethnology in the "Gazetteer of Upper Burma and the Shan States." The principal groups are the Burmese, Tai (or Shan) Karen, Chin (or Naga) and Kachin (or Chingpaw), and there are numerous branches. Regarding these peoples the writers say: "It must not be forgotten that the splitting up, intermingling, and transfer from one place to another have happened on so extensive a scale that hybridity is much more common than pureness of race. The Tai of the East have been greatly affected, but not absorbed by the Chinese and by the pre-Chinese races. Those of the West have come under the influence of the Aryan and Dravidian races and have been equally, if not more, affected and still not absorbed. . . . . Changes have been brought about not merely by conquest, or migration, forced or voluntary. Slave raiding was until comparatively recent times universal all over Indo-China. . . . . Where the Chief had twenty-eight wives, the Captain might well have had his half-dozen, and the plain soldier his couple. Most of the wives were aliens. Thus the physical features of the inhabitants of a locality might completely change in a couple of generations. . . . . The result may be seen on a small scale in the Shan Chiefs of ruling families. For years it has been the fashion for the Sawbwas (Chiefs) to have Chinese, Burmese, Karen and Kachin wives, sometimes captured, sometimes bought, sometimes received as presents. Occasionally the issue of such unions succeeded to the State, with the result that often a Sawbwa is in appearance of a different race from the bulk of his subjects."

The immigration of Indians, many of whom take Burmese wives, has led to a further hybridization, the offspring being commonly known as Zerbadee. This admixture has resulted in a class of people with Mongoloid physical features. It would be interesting to know to what extent, if any, the blue-black patches occur in Zerbadee children. I have made no observations as yet on this point.

It will thus be seen that there is much scope for investigation regarding this anthropological test in

Burma, which is so closely in contact with China on one side and India on the other. The presumption is that admixture with Chinese would not diminish the incidence of the patches, whereas that with non-Mongolian Indians would do so in course of time.

It is a disputed point as to whether the founders of the Burmese race came from India or, through China, from the Tableland of Asia. The *Gazetteer* has the following interesting passage: "We cannot yet say whether Burmese tradition, which represents that the founders of their race and nation came from the west, from the valley of the Ganges, into their present seats is right, or whether they came through the South-Western Provinces of China from the Tableland of Asia, as Sir Arthur Phayre maintained. The history of the Shans, so far as we know it, seems to show that it would be unwise to reject peremptorily the Burman tradition because it appears to prove clearly that Phayre's theory was without foundation. Everything combines to prove that Forbes was right when he concluded: "That both the Tai and Karen races came by a different route from that taken by the Burman and Mon-Anam families. The Tibeto-Burman tribes, which now form the Burmese nation, arrived, according to their traditions, in their present seats from the westward, about six centuries before the Christian era. In confirmation of this we find a chain of fragmentary cognate tribes, reaching from the Gunduk River in the West of Nepaul to the banks of the Irrawaddy, the footprints, as it were, of the march of their race."

If the Burmese tradition is correct, it may yet be possible to trace the footprints of the march of this race by applying Herr Bealz's test to the "cognate tribes," if these have not already been absorbed or radically changed. There is, however, no information obtainable by me as to what cognate tribes are referred to. If they belonged to the Mongolian family, showing the characteristics of that group, and came from India, they would help to confirm the opinion expressed by Forbes regarding the Burmese race.

(5) *Herr Bealz's Test in Italy: The Relationship of the Blue Patches to Spina Bifida.*—Boulger, in his very interesting "History of China," gives a detailed account of the Mongol invasion of China, Japan and Burma. The Mongols, he says, were originally only one small clan among the numerous tribes bordering on the Chinese Empire. In the strip of territory lying between the Onon and the Kerulon Rivers, both affluents of the Amour, may be found the cradle of the Mongol race. It was in that region than Genghis Khan was born, probably about A.D. 1162. According to Boulger, Genghis Khan was a military genius of the very first order, and it may be questioned whether either Cæsar or Napoleon can, as commanders, be placed on a par with him. The "outpouring" of the Mongols and of the military triumphs of Genghis have been described by Gibbon in his immortal "Decline and Fall." It is recorded in history that the Mongols penetrated as far west as Austria. In the thirteenth century Burma was invaded and conquered by the Mongols, who advanced as far south as the neighbourhood of Pegu. The Mongol conquests during the twelfth, thirteenth and fourteenth centuries affected not only the greater part of Central Asia, but also Eastern Europe. It is hence not surprising to learn that traces of Mongolian blood have been recently found in Northern Italy. In the *British Medical Journal*, Epitome, December 9, 1911, the following notes have been recorded under the title "Mongoloid Maculæ." "Consiglio (*La Pediat*, July, 1911), under this title, describes those curious pigmentary stains, usually of a bluish colour, which are sometimes seen on the sacral or gluteal region of infants. The condition was supposed to be a special peculiarity of Japanese babies. Apparently it is not confined to the Japanese, for out of 1,457 children seen in Parma during last year the author was able to find thirty-two who showed these pigmentary stains, and he gives diagrams illustrating the site and size of the spots in each case. In colour they vary from a distinct blue to various shades of blue and violet. They do not disappear on pressure, and may fade off into the healthy skin, or end abruptly in sharply defined lines; they may appear as discs, streaks or dots of pigment. In any case they usually disappear in later life. As to their etiology, the author takes the view that they are probably atavistic, and due to some distant Mongolian admixture, and he points out that in the fifteenth century a large trade was done in foreign slaves. For example, Venice alone imported every year 10,000 persons of every race. It has been suggested that these spots are abortive cases of spina bifida.

Consiglio's interesting observations confirm the opinion expressed by Herr Bealz, that these pigmented patches are an important anthropological test. It is noteworthy also that this hereditary marking has persisted through so long a period as nearly five centuries. It would be interesting to know to what extent, if any, the other Mongolian characteristics were traceable in the children who were born with the blue marks. It is quite possible that British children may also be found with these marks, which may similarly point to some near or distant Mongolian ancestor.

In my opinion the spots do not in any way point to an abortive spina bifida. The spots and patches occur not merely in the region of the spine, but in other parts of the back, sides, abdomen, &c. By no stretch of the imagination could these be regarded as abortive cases of spina bifida. During eighteen years' service in Burma I do not recollect ever seeing a single case of that disease. In the Myaungmya district, as has been stated before, the patches are found on at least 90 per cent. of infants, and yet not a single case of spina bifida has been seen. The condition appears to be equally rare in China, and is not even mentioned by Jefferys and Maxwell in their "Diseases of China." The blue marks first described by Herr Bealz appear to be merely a hereditary Mongolian characteristic, and are a valuable test in anthropology. There is still a large field for investigation in this subject in Burma amongst the various tribes that inhabit this interesting country.

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THE JOURNAL OF

Tropical Medicine and Hygiene

AUGUST 1, 1912.

THE RETIREMENT OF SIR PATRICK MANSON, M.D., G.C.M.G., F.R.S.

NOT in the lifetime of any of us has the retirement of any member of our profession from active professional life been attended by regrets so sincere as those which have been occasioned by the news that Sir Patrick Manson has resigned the post of medical officer to the Colonial Office. Not only is Sir Patrick resigning the office he adorned, but he has determined also to retire from practice. The authorities at the Colonial and Foreign Offices are no doubt keenly appreciative of the loss they have sustained, but all those more especially engaged in the study of tropical diseases at home and abroad must feel that the active head and ornament of their branch of the profession is being lost to them. The writer feels as though the pillar on which he leant for advice and guidance in almost every phase of tropical medicine is broken, and the same feeling will be with all those engaged in the study and practice of tropical diseases who have read of his retirement. Sir Ronald Ross once referred to Sir Patrick as the "father of us all," and it is in this sense that we have come to regard the man who laid the foundation of a new branch of medicine, raised it to a position of world-wide eminence, and gave to Britain the foremost position in the field of Tropical Medicine. It was a fortunate chance, it may even be termed a providential interference, that turned the young lad who began life in an engineering firm in Aberdeen from continuing the hammer and anvil to take to the study of medicine in the university of that town. It was again an epoch-making circumstance that sent him to China soon after he was qualified, where, in the isolated and out-of-the-way island of Formosa, he began his career as a medical practitioner. Cut off from his professional brethren, with but two or three white men as his neighbours, Formosa would, at first sight, appear as a place of little promise for the development of a young man's talent, having no contact with kindred spirits to encourage him or to stimulate him to probe more deeply the intricacies of the new diseases he met with in the China Seas. Looked at now, however, we interpret the removal from the more active scenes of practice in a large centre as explaining the development of Manson's mind by the fact that he had time to think and to develop the genius that was native to him. The subject which first attracted him was that of filariasis; the embryos had already been seen in the blood by Lewis and Cunningham in India, but the interpretation of their presence had gone no further, nor was there any precedent in any department of research to serve as a guide to Manson in his self-framed idea that perhaps the mosquito was the carrier of the disease. We speak nowadays glibly of "hosts" and "alternative hosts"; we no sooner find a parasite than we seek for the animal in which it abides during a period of its existence and undergoes developmental changes therein. When Manson conceived the idea that the mosquito conveyed the infection, and further, when he proved that in the mosquito the filaria embryos underwent processes of development necessary for the continuance of their species, it is safe to say no such conception had ever entered the brain of man, and certainly never had been proved by anyone. The part played by the mosquito in filaria was a discovery that revolutionized science; it served to start mankind on a new tract of thought and a fresh field of investigation. It may be even said to have been the creation of a new world in science, for there were no fields in existence in this sphere of research when Manson brought the astounding fact to light. So steeped in darkness were we at the time, that when Manson published his observations, and when he personally explained his discovery to "authorities" at home, no one grasped its importance, and this the most astounding observation ever made in the field of parasitology fell flat. His reward came later; science had advanced a step when he promulgated his mosquito-malaria theory: the investigations in Formosa gave the key to an explanation of a larger problem. Filaria was but a curiosity to "those at home," the disease and not the extraordinary principle Manson had enunciated was thought of; the chaff and not the wheat was considered—yet was this grain fated to develop into a crop so abundant that it was to fill the granaries of science with a never-failing store and supply lasting food for scientific thought. From the knowledge the filaria-mosquito theory afforded Manson

succeeded in demonstrating conclusively that the mosquito-malaria theory was correct, and science, rising from her long sleep, started afresh, reached out into many neglected by-ways, gathering knowledge everywhere, and thereby brought comfort and relief to the stricken and suffering throughout the habitable globe. Others have done excellent work in malaria and in many tropical ailments besides Sir Patrick; many of their names are household words in science, and are acclaimed wherever mentioned; but all will readily own that their work is but an offshoot of Manson's teaching, for the idea of the host, and the pursuit of the alternative host, has brought honours to many men and raised them to high positions amongst their fellows.

From the moment Manson saw in the field of the microscope the evolution of the flagellated body from the crescent a new direction was given to scientific thought. He reasoned that as the flagellated body does not come into existence until the blood is outside the body, as in the field of the microscope, that the function of the flagellum lay outside the human body, and that the flagellated body was the first phase of the extra-corporeal life of the malaria parasite, and concluded that in a blood-sucking animal—a mosquito—was the life cycle of the parasite completed.

The function of the mosquito in this direction in filariasis Manson had already proved in his Formosan solitude, and the result of these observations was only appreciated when he applied the knowledge he there gained to malaria. The enunciation of the mosquito-malaria theory was assailed by some who failed to grasp its meaning and importance; by some who ridiculed the idea that the terrible scourge of malaria could be caused by a bite of a mere mosquito; but a few men had become educated to a stage beyond the ignorance of the days when Manson gave the world the filaria-mosquito theory, and with their assistance the machinery for proving that the mosquito was the active agent in the spread of malaria was set agoing.

Surgeon-Major Ronald Ross (now Sir Ronald Ross, K.C.B.), I.M.S., at this time came within the sphere of Manson's teaching, and becoming thrilled with the spirit which imbued the master mind, he succeeded after a three years' investigation on the lines laid down by Manson.

In connection with malaria, Laveran's name will ever be remembered as the discoverer of the parasite, but the practical application of the knowledge Laveran gave us was without significance until Manson's mosquito-malaria theory was enunciated. It has been the same with many similar discoveries. Waller in London, for instance, saw the leucocytes leave the blood by passing through the capillary walls and gain the surrounding tissues; the fact, however, remained a mere physiological observation, and it was not until Cohnheim showed the pathological meaning of the extrusion of the leucocyte that the significance of the observation was manifest. Again, Lister gave us the practical application of Pasteur's researches. On the other hand, modern science is attempting to explain Jenner's observation concerning small-pox, and the physiologist's observations of to-day are explaining scientifically the meaning of the dietary laws of Moses.

The difference between men has been declared to be the power of formulating ideas, and surely no more important idea was ever formulated than the mosquito-malaria by Manson. The extension of its application would seem to be interminable and inexhaustible. New branches of science have leapt into being. The entomologist, the helminthologist, the parasitologist, and the epidemiologist have been raised from insignificance to positions of scientific eminence and importance. The economist and merchant have come to see that science is not mere theory, but that modern research plays an intimate part in business dealings. The success of undertakings of all kinds in warm climates has been shown to depend on the healthiness of a region to an extent unknown heretofore. Gorgas made the Panama Canal possible by freeing the Canal Zone of diseases due to the presence of mosquitoes. The food of all mankind will be cheapened when the carriers of diseases are better known and the principles enunciated by Manson are universally applied. Unlike many other investigators, Manson kept continually before him the application of his researches. A clinician of the first rank, he never lost sight of the true object of research, namely, the alleviation of disease. Few men have been thus endowed; in his branch of science and medicine he combined the scientific methods of a Pasteur and the practical application of a Lister. By Manson's retirement we are losing his guidance, his example, and his advice, but while time remains his teaching will never be forgot, nor will the work he has done ever fall into oblivion. J. C.

Annotations.

Trypanosoma gambiense in Antelope.—Fraser and Duke, in the *Journal of the Royal Army Medical Corps*, vol. xix, No. 1, July, 1912, write on the question of antelope being infected with *T. gambiense*. As they state, the Sleeping Sickness Commission of the Royal Society, Uganda, 1908-10, showed that waterbuck, bushbuck, and reedbuck could readily be infected with a human strain of *T. gambiense* and that clean laboratory-bred *Glossina palpalis* were capable of transmitting the virus from the infected antelope to susceptible animals. The authors continued this work and now record observations made upon these antelope during the eight months subsequent to the Commission's departure from Uganda. Further they find that the duiker, another species of antelope common in most parts of Uganda, can also be similarly infected with a human strain of *T. gambiense*. As regards the antelope employed by the Commission, six of the nine remained in apparently excellent health in April, 1911—roughly a year after they were infected. Fraser and Duke finally conclude:—

(1) That antelope may remain in apparently perfect health for a year after having been infected with a human strain of *T. gambiense*.

(2) That one antelope was still capable of infecting clean laboratory-bred *G. palpalis* 315 days after it had been infected.

(3) That a small quantity of blood taken from one antelope 327 days after its infection was proved by inoculation into a white rat to be infective.

(4) That as the interval after the infection of the antelope increases, their infectivity as tested by "cycle" transmission experiments, dissection of flies which have fed upon them, and by the injection of the buck's blood into susceptible animals, appears to diminish.

(5) And finally that a duiker was infected with a human strain of *T. gambiense* by feeding infected *G. palpalis* upon it.

The Bacteriology of Asylum Dysentery.—In the *Journal of Hygiene*, vol. xii, No. 2 (June, 1912) Tebbutt, writing from the Bacteriological Department, Lister Institute, deals with the bacteriology of asylum dysentery. His conclusions are:—

"(1) That a number of dysentery bacilli of the mannite-fermenting type have been isolated from an English asylum.

"(2) These bacilli may be divided into two subgroups: (*a*) those that do, and (*b*) those that do not (1) ferment sorbite and (2) form indol in peptone beef broth in six days.

"(3) Several attempts to infect a monkey with sorbite-fermenting strains were not successful.

"(4) No dysentery bacilli were found in an examination of a considerable number of flies infesting the surroundings of chronic and acute cases of bacillary dysentery."

Abstracts.

SOME NOTES AND SUGGESTIONS IN CONNECTION WITH THE ETIOLOGY OF BOVINE ONCHOCERCIASIS.*

By J. Burton Cleland, M.D., Ch.M.Syd.
(*From the Government Bureau of Microbiology, N.S.W.*)

Dr. Cleland states that for some years past the presence of worm nests (due to *Onchocerca gibsoni*) in the briskets of Australian cattle, has given rise to much controversy amongst pathologists, helmintholo-gists and health officials, whilst the economic loss to Australian producers has directed the attention of the Federal and State Governments to the question of prevention. It may be well to repeat here—a statement already made by Dr. Johnston and Dr. Cleland on several occasions—that from a health aspect the presence of these worm nests is quite harmless. Condemnation of affected briskets by health authorities, on the ground that such meat is injurious to man, is not warranted, and such condemnations must, therefore, be based on questions of sentiment and unsightliness, and on the fact that, pathologically, the presence of worm nests constitutes a disease. These latter points must, naturally, receive consideration at the hands of medical inspectors of food supplies, but whether or not they are sufficient of themselves to justify legal condemnation of affected parts, Dr. Cleland is not in a position to say. Be this as it may, the admission of affected briskets into Britain has been stopped, and even were they admitted, with or without diffusion of the nodules, the marketable nature of the affected part might be seriously affected. It is of interest to note, however, that in parts of Australia, where such meat is regularly consumed, no depreciation in value seems to attach itself to the presence of the condition.

From the foregoing it will be seen that the occurrence of worm nests entails a considerable economic loss to Australia. With the discovery of the full life-cycle of the parasite it may or may not be possible to successfully control the condition, or even stamp it out. Since an intermediate host is, almost certainly, the means by which fresh beasts are infested, investigators are searching far and wide to determine what this host can be.

As other species of onchocerca infest the horse, the camel in Africa, and even man, the discovery of the intermediate host is important.

Dr. Cleland then describes a series of observations made on cattle. In June, 1911, a calf about 18 months old died at Milson Island. At the *post-mortem* examination several worm nests were detected in the brisket, and living embryos were found in some of these nodules. This calf had been born on the Island: its mother was examined, but no palpable worm nests were detected in the brisket or elsewhere. Another calf from the same mother was then about 6 months old, and no worm nests could be detected by palpation in it.

On June 29, various cattle on the station were examined, with the following results:—

The mother of the preceding.—No worm nests were detected. This cow was said to have recently had some small sores or pustules on the udder when nursing her last calf, now about 6 months old. There were now present several small scabs on these areas. These were pricked and films made from their juice, but no onchocerca embryos were seen.

Another cow.—This animal was received at Broughton Island, North of Newcastle, in 1906, from what locality is not known. It was transported to Milson Island on the opening of the Experimental Station there, in 1908. An examination on June 29, showed the presence of worm nests in the loose tissues in front of the brisket. One of these was very large, being about the size of a bantam's egg, the other considerably smaller, and about the size of a small marble. They were freely movable under the skin and over the muscles. A part was shaved and pricked with a needle to about the depth of one-eighth of an inch over the tumours, though not reaching them, and serum and blood were pressed out. Several slides were made, but no embryo worms were found. During

* From the *Australasian Medical Gazette*, No. 380, April 27, 1912. Vol. xxxi., No. 17.

the process the nodules were exposed to some pressure. Blood smears were made on a number of occasions in August from the same areas, usually with some manipulation of the nodules, but all were negative.

On examination of the cow on October 6, the large irregular nodule was found to be replaced by a soft diffuse, fibrous thickening. The small nodule on the other hand was now quite distinct, rounded and firm, and the size of a large marble. Blood smears were made in the neighbourhood of the nodules, but no embryos were found in these. On October 14, the appearance was as before. Blood smears were again made, three in number, no embryos were seen. Nine biting lice (hæmatopinus) were on this occasion caught on the cow, all being on the under side, chiefly round the brisket and near the forelegs, and one in front of the udder. Five of these were teased, but no embryo worms were found on them; four were mounted after clearing. On November 17 the condition of the cow was much the same as previously; scattered on the under surface near the brisket, feet, &c., were some minute scabs with slight surrounding induration. Smears were made from some of these near the udder and near the brisket, but no embryos were seen.

A calf, born on Milson Island on November 15, 1910, was next examined. (Its mother has since died, and at the *post-mortem* was carefully searched by the assistant in charge of the Island, for worm nests, but none were found.) On August 25, 1911, a small nodule, not much larger than a pea, was felt in the loose tissues just at the anterior end of the sternum. On October 6 two separate nodules could be felt, each the size of a small marble. On the 14th the condition was the same; examined on December 10 one of the nodules seemed softer and more diffuse than previously. During the various examinations made, it should be noted that the nodules had been subject to some degree of pressure, and on the latter date, December 10, firm manipulation was practised. On examination on January 18, only one nodule, firm and round, was detected, the other being replaced by a diffuse fibrous thickening.

The finding of worm nests in cattle at the Experiment Station on Milson Island is of considerable importance in unravelling the etiology of the disease, inasmuch as some of the animals thus affected were calves that had been bred on the Island and had never left it. It is consequently obvious that infection, by some means or other, occurred on Milson Island itself, which is separated from the mainland by a stretch of water, at the nearest a quarter of a mile wide, and is located in a situation where cattle on the mainland are very infrequent. It is, therefore, practically certain that infection had occurred on the Island itself, and, further, that the source of infection must have been some of the older cows or other cattle with which the island was originally stocked. On Milson Island, therefore, all the necessary means for the conveyance of the infection from an infected animal to calves exists. A consideration of the possible factors at work in dissemination can, therefore, by means of these results on Milson Island, be definitely curtailed.

On Milson Island there are no definite areas of bog or marsh, by means of which infection might be conveyed through the intermediation of fresh-water crustaceans, &c. The only possible means by which this could occur is a fairly deep water hole, in which the cows do not wallow, and Dr. Cleland does not consider it at all likely that embryo worms could gain access from affected animals to crustaceans, &c., in this pool. No leeches or ticks have ever been discovered on the island, and these means of transmission, therefore, seem able to be excluded. If an intermediate host is required for the transmission of this disease, it would seem to me that such intermediate host must consist of one of the following types of arthropods:—

(1) *The Biting Louse* (*Hæmatopinus vituli*).—These occur in small numbers on adult cows and on calves. Their number is small, and prolonged search is required to obtain even a single specimen. It seems hardly possible that, during the period in which these calves have received their infection, such lice could ever have been present in more than very small numbers without incurring observation.

(2) *Mallophaga.*—These lice are considerably more abundant than the true biting lice on the cattle on the island, but even then are not numerous. It is hard to see how they could be the intermediary hosts inasmuch as they are not blood suckers. Should, of course, at any period, the embryos be present in any serum or blood exuded on to the surface of the skin, it might be possible for them to receive infection, but such Dr. Cleland considers an unlikely source.

(3) *Stomoxys calcitrans.*—This widespread fly is in comparative abundance on Milson Island, though less numerous where these cows and calves have been stationed than in other parts of the island. The large amount of blood taken in by these insects during feeding must mean that during the course of a few weeks a considerable volume of blood must pass through them, and in this way each insect would act in a fashion as a filter for any embryos that might be present in small numbers in the blood. An embryo ingested in this way would, presumably, rapidly enter the tissues of the insect (presuming it to be the intermediate host), and but rarely escape in its excreta.

(4) *Tabanids.*—Various species of tabanids are occasionally found on the island, but these are never numerous. They hardly seem a likely means of tranmission.

(5) *Mosquitoes.* — Mosquitoes are numerous on certain parts of the island, and have been biting cattle. The amount of blood they can ingest is, naturally, not nearly so much as can be ingested by stomoxys.

(6) *Culicoides molestus.* — This little sandfly is numerous on certain parts where cattle and calves are kept. Its minute size must mean, however, that only a small volume of blood passes through each individual during its life.

From a review of these various possible kinds of intermediary hosts, it seems to Dr. Cleland that we may practically dismiss as likely factors, mallophaga, tabanids, mosquitoes and sandflies, though perhaps none of these can be absolutely excluded. We, therefore, have the issue practically narrowed down to the likelihood of the biting louse, hæmatopinus, or the biting fly, *S. calcitrans*, being the intermediate host sought for. The paucity of numbers of hæmatopinus, the small amount of blood it can ingest, and (in the event of drawing blood directly from a nodule) the shortness of its biting proboscis suggests that it is less likely to be the agent than *S. calcitrans*. As already mentioned, *S. calcitrans* is present in moderate numbers and ingests large quantities of blood.

It is possible, of course, that the means of conveyance from animal to animal is not by means of an intermediate host, but by some more direct method of transmission.

Might embryos be transmitted directly from mother to calf? In this connection it is first of all obvious that auto-inoculation apparently does not occur, inasmuch as, if such were the case, old cows with many nodules and numerous embryos in the nodules, should show abundant crops of young nodules from the escape of the embryos from the parent nests into the tissues of the host. This has never been observed. It is possible, however, that by some means or other, embryos might gain entrance into the milk, and infection of the calf thus result from ingestion of the embryos into the stomach. Infection of the milk could occur either by embryos reaching the milk through the blood-stream or by the occasional presence of a worm close to or in the tissues of the udder, whence its embryos might escape either directly into the milk or by means of an exudation of serous fluid into the tissues on the outer side of the udder, be indirectly sucked in with it. If either of these latter were the case, one would presume that numerous nodules would appear in most of the affected calves.

Then there is the possibility of the means of transmission by fresh-water crustaceans. One fails to see any means so far by which fresh-water crustaceans can ingest the embryos, however. There is as yet no evidence that the adult worms ever reach near enough to the surface to liberate embryos on to the surface, and thus infect the water in which the crustaceans live, nor is there any evidence that embryos pass out to the external world by any other open channel. The conditions at Milson Island also negative such a means of transmission.

Thirdly, an ingestion by means of mallophaga or anoplura (true lice) might explain it. If either of the groups of insects mentioned could by any means ingest embryos, these might develop, to a certain extent, in such insect, and having reached the limit of growth in such a host might possibly remain in the insect for a long period waiting a further chance of development. Such a chance might occur when the calf searching round for the teats of the cow, sucked in one or more lice containing partly developed embryos. The embryos enclosed in the insect host having reached the true stomach might there be set free by the digestive juices (as in the case when the embryo of the guinea-worm of man is ingested with cyclops), and then with or without further development in the alimentary canal, the embryo might pierce its walls and eventually reach the brisket region. A means of transmission such as this would account for the frequency of calf-infection.

The most likely means of transmission, however, that suggests itself is that the embryos are taken up by some biting insect in blood or serum, undergo a certain phase of development in such insect host, and then, reaching the neighbourhood of the mouth parts, are again injected into a vertebrate host when the insect bites. The possible insect factors for this means of conveyance have already been discussed.

Before closing. Dr. Cleland thinks that three other points are worthy of consideration :—

(1) *Disappearance of Worm Nests.*—It has already been mentioned that a cow when first examined showed one large fibrous worm nest and a small one. In the course of a few months the large worm nest almost completely disappeared, leaving behind in its place a somewhat loose fibrous thickening. In one of the calves an apparently similar result occurred. Those who had studied sections of these worm nests, with their dense connective tissue walls, would be astonished that such a structure could practically disappear. It seems possible that during the course of manipulations the parent worm might have been injured in some way, and perhaps killed, and thus liberated some enzyme which had the property of loosening the fibrous tissue wall. It might be that such a dissolution of the wall was a natural phenomenon, which follows upon death of the worm. Such a disappearance of the fibrous wall would surely involve the setting free of the embryos entangled in it, and these could then enter the serous fluid or blood of the neighbourhood. As a consequence it may be that only shortly after this occurrence are embryos to be found in the circulating blood, or in the serous fluid round the worm nests. While, however, they are still in the circulation (if they thus reach it), ingestion of blood might infect biting insects. It is to be noted, however, that in the case of this cow, though blood slides were made on the discovery of the practical disappearance of the worm nests, embryos were not found. However, the point has been noted for further investigation.

(2) In the recent Annual Report of the Depart- of Agriculture and Stock, for the year 1910-11, Queensland, a statement occurs that these worm nodules have been found in sheep. If the worms thus found are *Onchocerca gibsoni*, the likelihood of the hæmatopinus of cattle being the intermediate host is very materially lessened, and the likelihood of stomoxys being such host is correspondingly increased. It is hard to believe, however, that the worm in sheep is actually the same parasite as that found in cattle, more especially when one considers that the onchocerca of the camel first found by Dr. Cleland in Western Australia, has been shown by Raillet and Henry to be a different species (*O. fasciata*) from *O. gibsoni*.

(3) The onchocerca worm nodules that Dr. Cleland

found in camels were located in the following situations: Underneath the jaw, in the neck, midway between the jaw and the thorax, and comparatively superficial; and embedded in the dense skin tissue underneath the tail. It would be of value to know whether these situations are those most favoured by camel-biting lice. Another interesting point in connection with the ecto-parasites obtained from these camels is the following: Specimens of the lice were forwarded to Dr. Nuttalt, of Cambridge. Apparently from him they reached Professor Neumann, who describes lice from camels "recently imported into Australia from India," as being the buffalo louse *Hæmatopinus tuberculatus* (Burm.) In a previous paper Dr. Johnston and Dr. Cleland suggested that buffaloes might be infested with onchocerca nodules, and it is a coincidence that the lice on camels, some of which contained onchocerca worm nests, were identified by Neumann as buffalo lice.

The position may be summed up by stating that it seems most likely that *S. calcitrans* is the insect host involved, that embryos from the worm nests are occasionally liberated into the blood-stream; and that thus the stomoxys during the course of its life has an opportunity of imbibing one or more of the sparsely distributed embryos, and that after a partial development in these insects, a fresh vertebrate host is inoculated. Next to stomoxys the most likely insect vector would seem to be hæmatopinus. Infection from hæmatopinus might occur in one of the two ways mentioned, either by direct inoculation, by means of the biting parts, or by ingestion into the stomach.

PROFESSOR LOOSS ON THE PASSAGE OF THE ANKYLOSTOME LARVÆ THROUGH THE LUNGS TO THE INTESTINES.*

In the literature dealing with the subject the question has occasionally been raised, whether the way through the lungs is the only one which the larvæ follow from the skin to the intestine. Tenholt, for example, writes as follows (1905): "It does not yet seem to be determined whether this migration from the skin through the lymphatic and venous system to the right chamber of the heart, the lungs and so on, is the only path marked out by nature for the larva, or whether by means of active migration it cannot reach the intestine directly, by some shorter way; in the case of an experimental animal, for example, from the dorsal or ventral region. Schaudinn found a larva in a lymphatic gland of the peritoneum. As among the other parasitic nematodes there are young stages which penetrate through the outer body covering directly to the interior, and thus to the intestine, so it would almost seem as though a similar course might originally have been indicated by Nature in the case of *Anchylostomum duodenale*. Indeed for some time it was actually assumed that mature rhabditis-like forms of this kind, for example, of *Dochmius trigonocephalus* of the dog, entered exclusively through the skin." With reference to this last sentence I can only observe that there must be some mistake; at any rate, I know nothing of an earlier assumption to the effect mentioned. Nor would the doctrine of the existence of a dermal infection have met with such general opposition had any analogous cases been known even as a matter of conjecture. Possibly Tenholt here refers to the penetration of the young of certain parasites into their intermediate hosts, but this cannot serve for comparison in the present case.

In connection with his attempts to infect cats and dogs with the human ankylostoma, Alessandrini (1905) makes some reflections on the path by which the larvæ reach the intestine and comes to the surprising conclusion that the direct way is the one more probable. He bases his view on two facts: (1) That attempts to infect cats and dogs through the mouth have hitherto been unsuccessful, or only partially successful; (2) that the number of adult worms which subsequently appear in the intestine is quite out of proportion to the number of larvæ applied to the skin. In defence of his view he further says: "If the larvæ actually take the path through the blood or lymph vessels, and thence go to the heart, and by the lungs to the bronchi, larynx, pharynx, œsophagus, &c., then they must develop on this journey special powers of resistance in order to withstand that destructive action of the gastric juice to which the larvæ introduced through the mouth are exposed; this does not seem logical. On the other hand it is much easier to imagine that the migration is direct, and the larvæ are decimated before reaching their destination by the innumerable obstacles which oppose them. The fact that they have been found in the various organs and leave many anatomo-pathological signs of their presence all along their way, does not seem sufficient evidence that they take precisely this way and no other."

I can refrain here from a special discussion of these views of Alessandrini's, since I know that they are no longer upheld by the author. Concerning the two actual reasons on which he bases his position, I limit myself to the remark that the first, viz., that attempts to infect cats and dogs through the mouth have failed or only partially succeeded, is not quite correct; the actual infection of dogs and cats through the mouth is perfectly easy; it is only impossible to bring the larvæ to sexual maturity in these animals unless certain special conditions are fulfilled. That the gastric juice of man is not in any way injurious to the young worms has been repeatedly shown; that it is not injurious to them in dogs and cats is seen from the further fact that larvæ which do not settle, but at once pass away through the anus, are found on examination to be perfectly lively and healthy. *The injurious influence of the*

* Being an abstract from the "Records of the School of Medicine," Cairo, vol. iv, 1911, p. 513-8.

gastric juice on the larvæ is a legend which ought at last to disappear from scientific discussions. As to Alessandrini's second reason, viz., the larger or smaller number of larvæ which do not reach the intestine, it may be mentioned that the larvæ even on their normal path encounter plenty of obstacles by which they may be thwarted.

According to Alessandrini, the fact that we find indications of the presence of the larvæ only along the path through the lungs is no stringent proof that they follow this path at the exclusion of any other. *Theoretically* no objection can be raised to this argument; I would, however, remark that *practically* we have not at present the slightest evidence for the assumption that, as an exception, some other, for example, the direct way through the body cavity may be chosen by the larvæ; all the observations actually made, on the contrary, decidedly support the conclusion that they do not follow this direct way. I will only point out that it was on this very path that I first looked for the larvæ, and it was only my constant failure to find them which gave me the correct clue. In reality, therefore, the case stands thus, that both actual observations and inner probability furnish evidence for the path through the lungs, while the theory of the direct path through the body cavity finds support neither from actual observations nor from inner probability. In my opinion, consequently, the path through the lungs must be regarded as the normal and the only one followed by the larvæ, so long as it is not proved that others are actually taken.

In a paper on "the part played by metazoan parasites in tropical pathology" Sambon (1908) happens to speak of the migration of the ankylostoma larvæ from the skin to the intestine, and says that "the original theory now stands on the firm foundation of experimental proof." On the other hand, he doubts "whether the trachea-œsophagus part of the journey was more than conjecture." He "thinks that the larvæ could certainly reach the intestine by a safer and more direct route." With regard to the first of these two remarks I may point out that there are two ways in which Sambon might have formed a definite opinion as to whether the trachea-œsophagus part of the journey was more than conjecture. The actual observations on which my statements regarding the migration of the larvæ are based are described in my communication to the Sixth International Congress of Zoologists in Berne, 1904, and in my article in 1905. Sambon does not seem to have consulted these articles; in any case, he does not mention their existence and is not familiar with their contents. Further, a series of preparations showing the ankylostoma larvæ in the various stages of their migration from the skin to the larynx, were made for the special purpose of distribution among investigators interested in the subject, so as to enable them to form an opinion of their own without lengthy experiments. One series of these preparations, together with a detailed description, was presented by me to the London School of Tropical Medicine. Sambon does not seem to have made use of these preparations although they were immediately within reach.

As to his second remark "that the larvæ could certainly reach the intestine by a safer and more direct route," I regret that the article does not state what this safer and more direct route is, by which the larvæ can "certainly" reach the intestine. In connection with the passage quoted Sambon alludes to the young stages of some species of *Cylicostoma* known to live encysted in the intestinal wall of their hosts, and to the young forms of *Sclerostoma vulgare* living in the aneurisms of the mesenterial artery of the horse. If Dr. Sambon, by these examples, means to suggest that *Agchylostoma duodenale* possibly passes through similar stages during its development, then it may be replied that this theory is as antiquated as it is unfounded. It is true that young individuals encysted in the submucosa have also played a part in the history of *Agchylostoma duodenale*, and it would have been comprehensible if Sambon had referred to them. The fact, however, that they are not mentioned seems to indicate that such was not his intention. Their biological significance may be regarded at present as sufficiently cleared up, whereas of the development of the cylicostomes we know little as yet, except that in their case larval stages have also been found encysted in the submucosa. It remains for Sambon to show what the safer and more direct route is by which the ankylostoma larvæ can "certainly" reach the intestine.

The above commentary was written early in 1908. Some months later, I again mentioned the subject in a critical article on Sambon's new "*Schistosoma mansoni.*" In a reply to this criticism, Dr. Sambon (1909) enumerates the reasons for his belief; they are these: "(1) The larval or immature forms of *A. duodenale* have seldom been found in the stomach; when found in this organ they were lodged beneath the epithelium. (2) They are invariably absent from the duodenum. (3) They have been found in the right heart, in the pulmonary and azygos veins, in the thoracic duct, in the peritoneum, in the kidneys, in the lymph glands and in the connective tissue of the most diverse parts. (4) At the beginning of the infection there is always an intense hæmorrhagic condition of the jejunum, which entirely subsides later on, notwithstanding the presence of enormous numbers of parasites in the intestines. This hæmorrhagic condition is in every way similar to that produced in the lungs by the migrating larvæ which seem to tear their way out of the vessels. (5) Immature forms have been found again and again in blood-filled spaces beneath the intestinal mucosa by Bilharz, Griesinger, Sonsino, Grassi, and many other competent investigators. (6) A number of other worms which inhabit the intestinal cavity at maturity, such as *Œsophagostomum*, *Sclerostomum*, *Strongylus*, *Heterakis*,

Ascaris, *Gnathostomum*, &c., in an earlier developmental stage, are usually found either free or encysted, beneath the intestinal mucosa, which they have reached, possibly, by way of the blood-vessels or lymphatics." On a recent occasion Dr. Sambon (1910) once more returns to the subject, not, however, by adducing any actual proof of his views, but simply by again urging his "belief"; saying that it was very important that the . . . experiments which had been made by Professor Looss should be repeated by others; that the theory of penetration through the skin had been completely confirmed; but after the larvæ had reached the lungs—and he was very strong upon that point—he did not believe that they penetrated through the œsophagus. He believed that they migrated by way of the lymphatics or blood-vessels, and thus to the intestine, as the larvæ have never been found in the stomach or duodenum in the early period of infection. With other parasites that he had investigated he had found this to be the way of migration, and he thought it very desirable that new experiments should be carried out, dealing with that portion of the journey of the ankylostoma.

As already pointed out, the chief item in this argumentation, as I read it, is Dr. Sambon's "*belief.*" The scientific value of any personal belief depends on the impersonal reasons by which it is supported; considering the reasons brought forward by Sambon in the present case, I cannot help finding that they are open to the same objections as I was obliged, on a former occasion, to raise against certain other of his statements, namely, that they are inaccurate with regard to both form and content. Thus, of the six points enumerated, numbers (1) and (2), to the effect that the larvæ have never (or seldom) been found in the stomach or duodenum at the early stage of infection, do not exist. Such larvæ were certainly seen and described by Lambinet and, in a somewhat older condition, by Schaudinn; that they were not recorded oftener is simply due to the fact of their not having been looked for within the first twenty-four or forty-eight hours after infection. Personally, I have seen them *by hundreds;* for in all my earlier experiments, devised to find the way taken by the larvæ, I regularly made sure whether or not, at the time of sacrificing the experimental animals, some larvæ had already got to the stomach and the intestine. (3) is explained by the highly developed thigmotaxy or automatic penetration of fissures exhibited by the larvæ; (4) is again based on incomplete knowledge of facts. The hæmorrhage in the intestine, when it occurs at all, does not appear until about nine days after the infection and coincides with the last moult of the worms, by which these assume their definite shape. This hæmorrhage has therefore nothing to do with the local hæmorrhages connected with the entrance of the larvæ. Reason (6), in the first place, does not mean very much since Dr. Sambon himself must admit that the respective species only "possibly" reach their habitat by way of the lymphatics, and is, in the second place, based on a mistake. With regard to the sclerostomes and cylicostomes, I can here add that their larvæ are not apparently capable of reaching their hosts by the skin at all. In some experiments made by me, at any rate, they did not enter the skin, nor did they, when brought into contact with this display any trace of that peculiar activity which is so characteristic of the ankylostoma larvæ under similar conditions. Therefore, if sclerostomes, &c., appear later in submucous cysts, they must have reached these from the intestinal lumen, as has been actually proved, or is at least most probable, also in the case of the other forms mentioned by Sambon.

So much for the actual value of the reasons on which Dr. Sambon bases his contention that the ankylostoma larvæ normally reach the intestine by the lymphatics or blood-vessels instead of the trachea and œsophagus. As a general objection to his assumption, I would point out in conclusion that, biologically, it is from the first improbable that ankylostoma larvæ, after having arrived in the lung by the lymphatics and blood-vessels, that is, by the only way which leads them both safely and directly to this organ, should thence as a normal occurrence embark on a way which, instead of leading them straight to their desired goal, would scatter them all over the body, while in the air passages and the œsophagus they again have a safe and direct route to that goal. However, it is not altogether impossible, and, indeed, even under normal circumstances, *i.e.*, in their natural hosts, certain larvæ stray from their usual path; they naturally do so still more under abnormal conditions, *i.e.*, in the case of larvæ artificially transferred to unsuitable hosts. But all these deviations, with which I have for years been familiar, are exceptions, incapable of shaking the rule that under normal conditions 90 per cent. of the larvæ reach the intestine by way of the trachea and œsophagus. I have no objections to the new experiments suggested by Sambon; on the contrary, I propose that at length he should undertake them. My own statements made on the preceding pages are founded on some sixty experiments and actual examination of thousands of individual larvæ in very different places. I have never thought, as Dr. Sambon (1909) chooses to intimate, of asking, either of him or of any other colleague, that he should "abandon his independence of judgment, or his right to give expression to his views" if these differ from mine; I only demand that, when any one finds it necessary to propound such views publicly, he also makes some earnest personal effort to support them by evidence equivalent to that which I have brought forward in defence of my views. This is what as yet still remains to be done by Dr. Sambon, in the present case as well as in others.

Finally, as to the so-called "young stages encysted in the submucosa" (Sambon, reason (5).

These were first observed by Bilharz (1852), who wrote concerning them: "Sometimes the mucous membrane of the intestine shows flattened elevations of the size of a lentil and of a livid reddish brown colour; these contain a cavity situated in the connective tissue between the tunica mucosa and muscularis, and curled up within the cavity a living worm (sometimes a male, sometimes a female) filled with the blood it has sucked." Bilharz, and later Griesinger (1854), explain this phenomenon by the assumption that the fully-developed worms bite deeper than usual into the mucous membrane. In opposition to these writers, Leuckart (1868), basing himself on the study of the life-history of certain sclerostomes of the horse, expresses the conjecture that the young individuals encysted in the submucosa possibly represent a normal phase in the development of the ankylostoma. Similar "cysts" were subsequently observed in one case by Grassi (1879), they were comparatively small in number and contained worms from 3.6 to 6 mm. in length. As to the way in which they should be interpreted, Grassi adopts Leuckart's views, but mentions at the same time that he also observed the same young worms in greater numbers living free on the mucous membrane of the intestine.

Subsequently to Grassi's observation I believe ankylostomes were not again observed in cysts of the intestinal wall. Leichtenstern (1887), who devoted special attention to the significance of these encysted stages, describes his observations as follows: "I am familiar with the behaviour and the changes which ankylostoma larvæ administered through the mouth present on the fourth, seven and eleventh day, and also in the fourth, fifth and sixth week, after the administration. Besides the various developmental stages of the worms which occur upon the mucous membrane of the intestine, I have never at these times found larvæ or further developed ankylostomes in or beneath the mucous membrane, either encysted or in any other form." Moreover, since Leichtenstern's successful experiments in infecting man through the mouth furnished no support to Leuckart's conjecture he rejects the view that the "young stages encysted in the submucosa" are a necessary or regular phase in the life-history of the ankylostoma, and re-adopts the older interpretation of Bilharz and Griesinger, viz., that they are "worms accidentally strayed," which have bitten deeper from the lumen of the intestine into the mucous membrane.

The question as to the significance of these encysted stages now requires consideration. At the beginning of my researches on the dermal infection I started from the working hypothesis that the larvæ, after penetrating the skin, reached the lumen of the intestine directly by traversing the body cavity and the intestinal wall. On this path they would perforce have to bore through the wall of the intestine and therefore it seemed a likely conjecture that the young anklyostomes "encysted in the submucosa" were simply larvæ which had accidentally remained within the wall. When studying a case of *Uncinaria perniciosa* which in its host (*Felis tigris*) seems to live regularly in submucous cysts filled with blood, Cohn showed (1899) that my interpretation was not correct, and was not even necessary, for the cysts of *U. perniciosa* all possess an opening communicating with the lumen of the intestine; which proves that the worms enter the mucous membrane from the lumen. These objections are undoubtedly correct, and were fully corroborated by the later investigations of my own which showed that the larvæ on their way to the intestine do not bore through its wall at all. Thus my earlier attempt at explanation is finally proved to be wrong, while on the other hand the interpretation of Bilharz, Griesinger and Leichtenstern gains fresh support from the recognition of the fact that the ankylostoma worms, from the moment when they assume their definitive form, feed on the elements of the mucous membrane and eat their way, so to speak, into it. This behaviour gives, I think, clear evidence as to the way in which the cysts arise and, in addition, supports the view that they are mere chance phenomena. As a matter of fact these stages "encysted in the submucosa" do not seem to have often been met with; at least, I find no data in the literature to the effect that they were again observed since the time of Grassi. Personally, I never observed them either in my experimental animals or in *post-mortem* examinations, although I frequently and carefully looked for them, especially in cases of severe infection. It was only about six years back that I once succeeded in finding a fairly adult specimen of the worm, which was lodged with about the fore half of its body in a cavity of the intestinal wall, about the size of a lentil, and filled with blood, while the hinder half projected freely into the lumen of the intestine.

More recently Goldman (1905) has again tried to establish a connection between the "young stages encysted in the submucosa" and the normal development of the ankylostoma. In describing the life-history of the parasite he writes: "The larvæ reach the intestine by the blood and lymph passages and seem to attain maturity in its submucosa. Then the adult parasites break through the mucosa and establish themselves in the intestine." It will be clear from what has been said above that these views have no foundation in fact.

In disagreement with all I can find in the literature on the subject, Sambon states that "immature forms" (viz., of the ankylostoma) "have been found again and again in blood-filled spaces beneath the intestinal mucosa by Bilharz, Griesinger, Sonsino, Grassi, and many other competent investigators." It would interest me very much to learn who these "many competent investigators" are who found the cysts, and where they were found.

Notes on Books.

THE TREATMENT OF DISEASES OF THE SKIN. By W. Knowsley Sibley, M.A., M.D., Physician to St. John's Hospital for Diseases of the Skin, London.

The author states in his introduction to his book that the work is meant to be a handy reference book for the use of dermatologists, practitioners of general medicine, and students desirous of ascertaining the treatments most commonly adopted for the ordinary, and some of the rarer, forms of diseases of the skin met with in this country. Part III, giving a list of prescriptions, will certainly be found to be of great use, but the other parts may be studied with advantage also. The value of the book, of course, will be greater for practitioners in England than for those studying abroad, because tropical skin complaints are not incorporated in the text. This latter branch of dermatology is one that requires much study, and it will well repay anyone to devote his energies to it, the field being, more or less, a new and unexplored one.

Notes and News.

THE Straits Settlements Gold Medal in Tropical Medicine of Edinburgh University, a medal awarded to the writer of the most distinguished thesis on a tropical subject submitted during the three years preceding the date of award, was presented to Dr. George C. Low, at the Graduation Ceremony, held in Edinburgh on Friday, July 12, 1912. Dr. Low's thesis, for which he had already received a University Gold Medal in 1910, was on "Human Filariasis," a subject on which he has done much original work, amongst other things, having discovered the passage of the metamorphosed filaria through the proboscis of the mosquito back to man.

"Lancet," July 6, 1912.

The so-called X Bodies.—Balfour writes drawing attention to Chamberlain and Vedder's paper in *The Philippine Journal of Science*, vol. vi, No. 5, p. 421, on "The so-called X Bodies as Artefacts in Glass Slides." These two observers claim to have demonstrated that the X bodies are really artefacts in the glass slides on which the blood films are made, and have therefore nothing to do with parasites. Balfour on finding a slide which showed what appeared to be X bodies, washed it and the bodies disappeared. He therefore concludes with Chamberlain and Vedder that this condition is only a fallacy.

Correspondence.

DIFFERENTIATING THE VARIOUS MODIFICATIONS OF THE ROMANOWSKY STAIN.

To the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

SIRS,—I wish to call attention to a method of differentiating the various modifications of the Romanowsky stains, by means of which not only may very beautiful preparations be obtained, but far more accurate knowledge gained of the structure of the nucleus of protozoa. I have been using the method for several months in the study of the common, if not the sole pathogenic entamœba of this region—*E. tetragena*. Smears are stained first with Leishman's, Wright's, or Hasting's stain, and if upon inspection a smear contains a sufficient number of entamœbæ for further study, it is then stained by Giemsa's stain until the film has a purple cast. It is then plunged into 60 per cent. alcohol, to which 10 to 20 drops aqua ammonia have been added. The slide is kept in motion and examined from time to time, either with the high, dry or water immersion lens, until the desired differentiation is obtained, when the film will be seen to have a violet colour.

The cytoplasm of entamœbæ is stained various shades of blue, idiochromidia navy blue, and the nucleus presents an appearance quite different from the usual descriptions based on Romanowsky preparations stained in other ways without differentiating. The nucleus stains rather faintly blue, and is seen to be made up of a mass of very slightly refractile globules, which are more evident in some preparations than in others, surrounded by a pale blue halo. Within this nucleus a variable amount of purple staining substance is seen. This substance, usually called the nucleus, but which represents only a portion of same, presents a varied appearance—sometimes as a ring (karyosome), sometimes as a reticulum, occasionally as fine granules.

By means of this method many of the errors of interpretation, due to the use of other non-differentiated staining methods, are avoided. Bodies which have been mistaken for nuclei and chromidia resolve themselves into more or less defunct erythrocytes, bacteria, or white cells. Old dry stained smears which have been over-stained, or are otherwise unsatisfactory, may be recovered by differentiating with the ammoniated alcohol. The amount of ammonia used may be slightly increased with very thick films, or the action prolonged. With thin films the amount of ammonia must be diminished and the action shortened. A number of specimens which had been well stained, but not differentiated, and in which it was thought developmental phases of "*E. histolytica*" could be detected, were seen to resolve themselves into *E. tetragena* upon differentiation with ammoniated alcohol. No protozoologist would think of studying protozoa by means of undifferentiated hematoxylin preparations, and as the Romanowsky stains overstain almost equally well they should similarly be

differentiated. The method is recommended for the differentiation of all classes of polychrome-methylene-eosin-blue stains. S. T. DARLING.

Board of Health Laboratory,
Ancon, Canal Zone, June 29, 1912.

PREVENTION OF CANCER.

To the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

MEDICAL observers are agreed that the chief predisposing causes of this disease are chronic irritation and injury. Therefore, if the following rules were observed there should follow considerable diminution in the mortality from cancer which, in the Harrow district, has caused more deaths than tuberculosis during the last five years:—

Rule 1.—When warts, moles (especially dark-coloured) and other skin growths are exposed to constant irritation they should be immediately removed.

Rule 2.—Workers who use tar or paraffin are especially liable to hard warty growths on the hands, forearms and other exposed parts of the skin, Treatment should be sought early for such growths, as they may readily go on to cancer. Sweeps should take daily baths to remove the soot. Workers with X-rays should be effectually protected.

Rule 3.—Avoid excessive smoking, as it predisposes to cancer of the lips, tongue, cheeks, &c. Inhaling cigarette-smoke irritates the vocal chords.

Rule 4.—Avoid irritation of the tongue and cheek by broken, jagged teeth, and of the lips by certain kinds of inferior clay pipes, which leads to cancer.

Rule 5.—Avoid excessively hot food and drink, which induce cancer of the throat. Fluids and solids should not exceed 100 degrees Fahrenheit. Many people take food and drink at 120 to 150 degrees Fahrenheit.

Rule 5*a*.—Avoid taking large quantities of iced drinks and ices, as digestion ceases when the temperature of the stomach is reduced below the normal.

Rule 6.—Masticate all food thoroughly, as food imperfectly chewed causes chronic irritation of the alimentary canal, involving the gullet, the entrance and outlet of the stomach, as well as that organ itself, and various parts of the large and small bowels, especially the termination of the former. Cancer of the food tract may spread to the liver, gall-bladder, pancreas, &c.

Rule 7.—Take great care of the back teeth, or grinders, and see that all of them are present and in perfect order. Dentists should be employed to make good any deficiencies. Money spent on the teeth will bring a greater return than any other investment.

Rule 8.—Avoid bolting imperfectly masticated food. This bad habit can be cured by not drinking during a meal. Liquids may be drunk in small quantities at the end of a meal, or in larger quantities between meals.

Rule 9.—Do not delay when cancer is suspected. Early recognition and prompt removal deprives cancer of its terrors. The mutual assistance of the patient and the practitioner is essential to early diagnosis, and a grave responsibility rests on both. Thousands of lives of women suffering from cancer of the womb, and of the breast, could be saved by early diagnosis and operation.

Rule 9*a*.—Avoid constipation. This is to be done by judicious diet and exercise, and, should these fail, by physical and medicinal treatment.

Rule 10.—Avoid the use of alcoholic drinks, as they are a predisposing cause of cancer, and diminish the average prospects of survival by 30 per cent.

Rule 11. Circumcision should be performed in early life.

JOHN FLETCHER LITTLE,
M.B.Cantab., M.R.C.P.Lond.,
Medical Officer of Health, Harrow-on-the-Hill.
London, W.
July, 1912.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"British Medical Journal," June 29, 1912.

Spirochætes in Cercopithecus ruber.—Ranken states that he has found a spirochæte in the blood of a monkey (*Cercopithecus ruber*) captured in the Lado Enclave Sudan. The organism was short and thick—roughly 8 to 12 μ in length—and showed active movement and progression across the field. Spherical terminal refractile dots were present but extrusion of granules was not observed. Spirochætes have been observed also in *Cercopithecus patas* in Senegal (Thiroux and Dufougere), and Castellani and Chalmers also describe a spirochæte (*S. macaci*) in monkeys in Ceylon.

"Kala Azar Bulletin," No. 3, July 11, 1912.

Leishmaniasis.—The above number of the *Kala Azar Bulletin* contains the following papers: "Kala Azar in India" (with map); "Kala Azar in the Anglo-Egyptian Sudan" (with map); "Kala Azar in China"; "Kala Azar in the Mediterranean"; "Kala Azar in Dogs"; "Experimental Kala Azar"; The Culture of Leishmania"; "Pathological Changes and Distribution of Leishmania in the Tissues"; "The Structure of Leishmania as found in the Tissues"; "Oriental Sore in Cambay, and Other Papers"; Quarterly List of References.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

TROPICAL PELLAGRA.

By Lucius Nicholls, B.A., M.B., B.C.Cantab.
St. Lucia, West Indies.

At the present time there is an increased number of observers who are becoming supporters of the theory originated by Sambon that pellagra is caused by a protozoal parasite, and it is suggested that this is carried from the diseased to the healthy by a "sand fly"—a very pretty theory. On the other hand, there are still numerous votaries to one or other form of the "maize theory," which suggests that the disease is brought about by too great use of diseased or normal "maize."

It is possible that the pellagra of Southern Europe and Northern Africa may not be exactly the same disease as the pellagra of more tropical parts of the world, and it may be caused by a parasite thriving in those, whose resistance has been lessened by an improper diet. But undoubtedly, a number of cases occur in the tropics which present all the symptoms of pellagra, and are due to improper feeding, which may have been brought about by disease, vice, or poverty.

The protozoan theory seems to be founded on the increase in the number of mononuclear leucocytes in the blood; the manner in which the disease spreads; and the morbid anatomy and the supposed beneficial effects of arsenical remedies. An increase in the mononuclear leucocytes occurs in many non-protozoal conditions, such as scurvy, starvation, chlorosis, typhoid, tuberculosis, and a large number of gastro-intestinal disturbances.

In the manner of its occurrence and morbid anatomy, there is much in common with this disease and such diseases as scurvy and beri-beri, which have now been definitely proved to be caused by a harmful diet. These diseases also are well-nigh confined to the poorest classes. This type of disease can closely simulate those caused by germs. In the 1907 edition of his book, Sir P. Manson states: "Beri-beri is undoubtedly a germ disease, for as not a few facts have shown the cause can be transported from place to place, and on encountering suitable conditions multiply as only a living organism can."

Now that the brilliant work of Fraser, Stanton, Coit, and others, has conclusively proved that beri-beri is due to the wrong use of rice, by which some necessary constituent is absent, and that the disease is not due to a micro-organism, students of tropical research may well thank this high authority for the above statement, for it is a warning how easy it is to be misled as to the nature of the disease.

I have called the following nine cases pellagra (or tropical pellagra if they materially differ from those of Southern Europe) because there were present in all five cardinal symptoms or signs: (1) Mental lethargy and depression (in some cases almost reaching wandering dementia); (2) gastro-intestinal disorder, with persistent diarrhœa; (3) erythematous eruption on the dorsum of hands and feet, proceeding to superficial ulceration; (4) great emaciation; (5) tongue and gums red, clean, and spongy, and slight tendency to bleed. This often extends to the pharynx.

To these I would add two others: (6) Loss of appetite, of an extreme degree, becoming almost a morbid refusal of all forms of food; (7) lessened coagulability of the blood (tested in four cases only).

These nine cases occurred consecutively and are not selected from a large number.

Great trouble was taken to obtain their family histories, inquiries being made of those who knew and were not interested in them, for the unreliability of their own statements is obvious, and when they had relatives their statements would not be as reliable as those of people entirely disinterested.

Case I.—C. E., aged 60 (or more), resident of the town for years.

History.—"She had been ill for three years with diarrhœa and the eruption of the hands and feet, which was continually appearing and then drying up (the times when it had appeared or improved could not be discovered). She was a well-known alcoholic vagrant, and had been such for years before she became ill. She had five children, four dead, one alive, but she did not know his whereabouts. No relatives had anything to do with her.

"She had spent what she could earn on alcohol, and lived chiefly on vegetables (yams, tanias, farine, &c., and occasional bread and a little maize). Her mental condition had rapidly become worse."

Condition on Admission.—She was an old, very emaciated woman, not of small frame: weight 87 lbs. Temperature normal; she walked unsteadily.

Mental Condition.—Lethargic and depressed, and cannot answer questions except in a wandering, uncertain manner.

Tongue and Mouth.—Much salivation, tongue clean and very red, gums red and a little spongy, pharynx red and congested.

Appetite.—Absent, could be induced to take no more than a few mouthfuls of milk.

Eruption.—Dark erythematous eruption on dorsum of hands and feet, and tips of ears and chin. In places, shiny, glazed and parchment-like, in others superficially ulcerated, flakes peeling off. Dark lines of demarcation on wrist and ankles. There were also numerous scaly patches on the legs.

Chest.—A few crepitations and harsh breathing at both apices. Area of cardiac dulness lessened.

Abdomen.—Liver not felt; area of dulness lessened. Spleen not felt: area of dulness lessened.

Bowels. — She had persistent, uncontrollable diarrhœa.

Urine.—Acid, faint trace of albumin, a few red blood-cells seen.

Fæces.—A few ova of *Necator americanus* and ova of *Trichocephalus dispar* were seen.

Blood.—R.B.C. 3,400,000. W.B.C. 5,400. Differential: Polymorphs, 52; eosinophiles, 18; hyaline, 5; lymphocytes (and transitional) 25.

Knee-jerks.—Absent.

COURSE OF DISEASE.

The eruption increased after the patient was admitted into hospital, and her mental condition became one of torpor and dementia. She was treated with thymol, and afterwards with sodium cacodylate and anti-diarrhœa mixtures, which failed to affect her persistent diarrhœa.

She died five weeks after admission, two or three days before death lying unconscious, cold, and moribund; pulse falling to 44, and respirations to 12. During the five weeks her temperature had a tendency to be subnormal, never rising above normal. She had persistently refused even milk, and the greatest persuasion would not induce her to take more than a few mouthfuls.

POST MORTEM.

Body and eruption was as seen clinically.

Both apices of lungs adherent, and exhibited patches of tubercles the size of a penny. Otherwise lungs were dry and natural. *Heart:* 5½ oz., small, shrunken. Valves natural, myocardium soft. Aorta, a few patches of atheroma. *Liver:* 32 oz., small, pale, soft (fatty degeneration). *Spleen:* Very small, but firm and hard; on section very *dark*. *Kidneys:* Small and soft (fatty degeneration). *Suprarenals:* Natural. *Stomach:* Wall, thin and atrophied; mucosa appears natural. *Intestines:* Very thin, the lower part of the ileum and the large bowels were congested, and the mucosa showed congestion, and in places some superficial ulceration. Eight *Necator americanus* were found. Twenty-four *Trichocephalus dispar* present. One *Ascaris lumbricoides*. *Brain:* Hard and firm; no engorgement of vessels. Other organs natural.

MICROSCOPICAL SECTIONS.

Liver: Extreme fatty degeneration. *Kidney:* Fatty degeneration and numerous areas showing many red blood corpuscles outside vessel walls. *Spleen:* An extraordinary picture, the red blood-cells were evenly distributed throughout the section, and were more numerous than the splenic cells. *Intestines:* Showed atrophy and fatty degeneration of muscular coats. There were also changes in the mucous and submucous layers.

CASE II.—A. St. C., aged 62, had lived in the town and country.

History.—"She had been living by herself in the country, where she had tried to provide for herself. Her food had consisted almost entirely of vegetables (yams, tanias, farine, &c.). Three months ago she came to live with her daughter who was very poor and had six young children. She did not get much to eat. It was here that she developed the eruption on the hands and feet, and her head became bad. She has never taken alcohol."

Condition on Admission.—She was an aged light-coloured woman of large frame. She weighed 113 lb. Her temperature twice rose to 99° F., usually it was about 97° F.

Mental Condition.—Patient wandering, vacant, and depressed, answers questions with difficulty and incorrectly.

Tongue and Mouth.—There was much salivation, the tongue being very red and clean, gums spongy. She complained that her mouth was sore, and her breath was fetid.

Appetite Absent.—She cannot be induced to take more than a few ounces of milk daily.

Eruption.—There was an eruption of a port wine colour on the dorsum of her hands, feet, and tips of ears. The line of demarcation was several inches above the wrists, and on the legs the eruption extended half way up their anterior aspect. There were several large blisters on the feet, which, breaking down, gave rise to superficial ulceration.

Chest.—Lungs and pleura natural. Area of cardiac dulness lessened.

Abdomen.—Liver can just be felt below the costal margins. Spleen not felt.

Bowels.—She has had much diarrhœa. (This improved on treatment.)

Urine.—Trace of albumin, a few red blood-cells brought down by the centrifuge.

Fæces.—No ova or parasites seen.

Blood.—Coagulability 1·35 (1 being normal time). R.B.C. 3,500,000, white 8,500. Differential polymorphs, 57; eosinophiles, 5; hyaline, 2; lymphocytes (and transitional), 36. Prolonged search revealed two or three malarial parasites.

Knee-jerks.—Natural.

COURSE OF DISEASE.

Patient gradually became worse, and her mind became more wandering. Her diarrhœa, which at one time ceased, returned again, and she rapidly emaciated.

CASE III.—A. C., aged 70, had lived in the town.

History—"An alcoholic vagrant of years' standing; she had been ailing for about nine months; recently she depended on begging for her food, and she obtained very little."

Condition on Admission.—Patient was an aged, black woman, very emaciated, but of average frame, weight 91 lb. Her temperature had never been more than 99. Pulse 55, artery very tortuous and atheromatous. She walked unsteadily.

Mental Condition.—Drowsy and lethargic, taking very little notice of her surroundings.

Tongue and Mouth.—Much salivation, the tongue red and clean, showing indentations of the teeth. Gums red and spongy. Complained that her mouth and throat were sore.

Appetite Absent.—Would take very little food.

Eruption.—Typical eruption on hands and feet.

Chest.—Lungs and pleura natural. Heart, area of cardiac dulness not increased. There was a mitral regurgitant murmur. Aortic sounds tacky.

Abdomen.—Liver can just be felt below the costal margins; spleen not felt. Area of dulness almost absent.

Bowels.—Persistent diarrhœa.

Urine.—Cloud of albumin, numerous blood-cells.

Fæces.—*Trichocephalus dispar* and *Ascaris lumbricoides* ova numerous.

Blood.—Coagulability 1·75 (1 being normal time).

R. B. C. 3,500,000. Differential:—Polymorphs, 52; eosinophiles, 16; hyaline, 4; lymphocytes, 28.

Knee-jerks.—Natural.

Course of Disease.—Gradually becoming worse, the diarrhœa being very persistent, and her mind becoming more lethargic.

CASE IV.—M. P., female, aged 36, resident of town and country.

History.—"Patient had been ill for four and a half months with diarrhœa and wasting. She had lost all appetite. Recently the mental condition appeared, and the eruption on the hands and feet started. She had four illegitimate children which she tried to provide for by her own efforts; she worked hard and denied herself. The youngest of her children is 12 months old, and the oldest about 7 years. She could not often afford meat or fish. She lived chiefly on vegetables, often not even getting bread."

Condition on Admission.—She was very emaciated. Temperature never above 98·4°, often 95° in the morning.

Mental Condition.—Very lethargic and depressed. Answers questions in a wandering, indifferent manner; answers often being incorrect.

Tongue and Mouth.—Much salivation, tongue clean and red, gums a little spongy and bled quickly on injury.

Appetite absent, takes only a little milk.

Eruption.—The eruption appeared after she had been ailing for two or three months. It rapidly became worse after admission to hospital. Her feet, hands, and tips of ears and chin, were affected. One blister had formed. Considerable superficial ulceration supervened. The palmar surfaces of the hands were also affected.

Chest.—Nothing abnormal noticed.

Abdomen.—The liver was obviously smaller than natural. Spleen likewise shrunken.

Bowels.—She had persistent diarrhœa from the beginning of the condition.

Urine.—In the earlier stages of the disease the urine had a specific gravity of 1,008 acid, with a faint trace of albumin and a few blood-cells.

In the later stages the specific gravity was 1,015 acid, moderate cloud of albumin and very numerous blood-cells; a few leucocytic and epithelial casts.

Fæces.—Prolonged search showed the presence of ova of *Necator americanus* and *Trichocephalus dispar.*

Blood.—R.B.C. 3,600,000, W.B.C. 6,500. Differential count: polymorphs, 54; eosinophiles, 7; hyaline, 4; lymphocytes and transitional, 35.

Patient gave a history of malaria, but no parasites were discovered.

Coagulability of the blood varied from 1·45 to 1·75.

Nervous System.—Knee-jerks sluggish, eventually they disappeared. She was unsteady on her legs. As in the later stages it was impossible to get proper answers from her; it was impossible to decide if there were any nerve disorders. She had complained of failing sight, the ophthalmoscope revealed a hazy disc, and in the right eye two small flame-shaped hæmorrhages.

COURSE OF DISEASE.

She became extremely emaciated and weak, her mind becoming almost blank. Her diarrhœa became continual; she became unconscious and died twenty-four hours afterwards.

POST MORTEM.

Body and eruption was as seen clinically.

Lungs and pleura: Natural. *Heart:* Small and soft. *Liver:* Small, showed fatty degeneration. *Spleen:* Very small. *Kidneys:* Small. *Stomach:* The walls were very thin. *Intestines:* The walls were thin. The lower part of the ilieum and the cæcum were very congested, especially the mucous layers. *Brain:* Firm, nothing very noticeable. *Parasites:* About half-a-dozen *ankylostomes* and a few *Trichocephalus dispar.*

MICROSCOPICAL SECTIONS.

The heart, liver and kidneys showed advanced fatty degeneration. The muscle of the intestines showed fatty degeneration. There were numerous minute hæmorrhages throughout the spleen, kidneys, and other organs, as shown by the numerous blood-cells outside the blood-vessels of those organs.

CASE V.—W. G., aged 64, resident of town.

History.—"Alcoholic vagrant. As he does little or no work he rarely obtains a proper subsistence."

Condition on Admission.—Emaciated, temperature normal. Weight, 111 lbs.

Mental Condition.—He was very depressed, and his mind was very sluggish; he required a few moments to make up his mind before answering a question.

Tongue and Mouth.—Almost normal, though perhaps a little redder and cleaner than would be expected.

Appetite.—Nearly absent. Says he does not want solid food.

Eruption.—Typical on hands and feet.

Chest.—Natural.

Abdomen.—Liver, area of dulness lessened. Spleen, area of dulness lessened.

Bowels.—Has had much diarrhœa. This improved in hospital.

Urine.—A faint trace of albumin, a few blood-cells with centrifuge. Sp. gravity 1016; passes about two pints per day.

Fæces.—Ova of *Ascaris lumbricoides* fairly numerous.

Blood.—No parasites.

Knee-jerks.—Very sluggish and difficult to elicit.

COURSE OF DISEASE.

His diarrhœa improved on treatment. His appetite returned. The eruption cleared up, and he started to increase in weight, being discharged weighing 2 lbs. more than on admission. His mind became clearer.

(He was given glycerophosphates, calcium chloride, and arsenic, during his treatment.)

CASE VI.—G. A., aged 46, resident of town for years.

History.—"He is an idle vagrant, but does not drink alcohol. Has done nothing but begging and

a little errand work for years. Lives chiefly on vegetables (yams, tanias, farine and bread, fruit when in season)."

Condition on Admission.—Tall, emaciated, old-looking man. Weight 109 lb.

Mental Condition.—Sluggish and depressed.

Tongue and Mouth.—Did not appear very red or spongy, but he has had bleeding from the gums and the nose.

Appetite.—Very small. He does not take much food.

Eruption.—Typical on the hands, feet, and half way up his legs. Also on the tips of ears and chin, and on left cheek.

Chest.—Nothing abnormal discovered.

Abdomen.—Liver and splenic areas of dulness lessened.

Bowels.—Continual diarrhœa present.

Urine.—No albumin, no blood-cells.

Fæces.—A few ova of *Ascaris lumbricoides* seen.

Blood.—R.B.C., 3,500,000. Differential count: polymorphs, 54; eosinophiles, 16; hyaline, 4; lymphocytes and transitional, 26; coagulability of blood, 1·75 times normal.

Knee-jerks.—Present.

COURSE OF DISEASE.

His condition did not improve, his temperature having a tendency to become subnormal. Weight continued to be lost, and diarrhœa persists.

CASE VII.—A. B., aged 37, female, resident of country.

History.—"She had been ill for three and a-half months with diarrhœa and wasting. She has two illegitimate children whom she must provide for. She tries to earn her living by washing, but has done very little work for about nine months. She does not drink. She smokes considerably."

Condition on Admission.—Thin, light-coloured woman, of moderate size. Temperature 99·2° F. Weight was 90 lb. Vacant appearance.

Mental Condition.—She was vacant and depressed, answered questions sluggishly and with apparent indifference.

Tongue and Mouth.—Her tongue was red and clean. She complained that her mouth was very sore.

Appetite.—Very small, but she attempted to take her food.

Eruption.—Typical on hands; none elsewhere.

Chest.—Natural.

Abdomen.—Liver dulness natural. Splenic dulness decreased.

Bowels.—Open eight to ten times in twenty-four hours.

Urine.—Faint trace of albumin, a few red blood-cells were brought down with the centrifuge.

Fæces.—A few ova of *Ascaris*, *Trichocephalus dispar* and *Necator americanus*.

Blood.—R.B.C. 2,500,000. Poikilocytosis slight. Normoblasts, a few present. W.B.C. 5.600. Differential: polymorphs, 55; eosinophiles, 10; hyaline, 2; lymphocytes and transitional, 34.

Knee-jerks.—Natural. Other reflexes natural.

COURSE OF DISEASE.

She was thoroughly treated for intestinal parasites. She was also given arsenic and glycerophosphates. She improved considerably, but her diarrhœa has never completely ceased.

CASES VIII and IX.—These were two cases of women who were suffering respectively from syphilis and pulmonary tuberculosis. They had become outcasts and entered hospital without being able to state a single friend or relation who had anything to do with them, beyond casual acquaintanceship. Whilst ill and weak, they had been obliged to provide for themselves.

They both showed signs of the advanced condition, namely, mental symptoms, the eruption, condition of tongue and mouth, persistent diarrhœa, trace of albumin and blood-cells in the urine, morbid refusal of food, and extreme emaciation.

The occurrence of intestinal parasites is universal among the labouring classes of this island. In over fifty post-mortems on labourers I have never failed to find either *Ankylostoma duodenale*, *Necator americanus*, *Ascaris lumbricoides*, or *Trichocephalus dispar*. All these patients were thoroughly treated for parasites. One point in which I have failed to agree with some observers is in the blood-counts; there was not an increase in the lymphocytes in all the cases.

The numbers given for the coagulability of the blood are the lengths of time taken for the coagulation to occur, the average time in the normal person being considered as unity.

SUMMARY.

These were nine consecutive cases occurring in the island of St. Lucia in a period of three months. In every case there was obtained a history of want and bad feeding; they can be divided into: (1) aged alcoholic vagrants (Cases I, III, and V); (2) non-alcoholic vagrant (Case VI); (3) unfortunates: (*a*) due to having to provide for illegitimate children (Cases I and VII): (*b*) due to age and poverty (Case II); (4) diseased and neglected (Cases VIII and IX).

If this condition were caused by a germ, one would expect to occasionally find a case occurring among children, or a member of the better classes or well-fed peasants. Furthermore, these cases, occurring among labourers in want, came in every case from a different locality; only in the case of two of these did the patients live within a mile of one another, these two being separated by about half a mile.

The condition of the organs, the extraordinary emaciation, the small hæmorrhages or diapedesis of red blood corpuscles throughout the organs, the lessened coagulability of the blood, the absence of much temperature or congestion of any organs, the presence of fatty degeneration—very similar in degree to what is seen in some cases of beri-beri—and the condition of the tongue and gums, indicate that the disease is more nearly allied to such diseases as scurvy and beri-beri than to any germ disease.

I have never seen the pellagra of Southern Europe, but from descriptions it appears to me to be the

same disease, or very closely allied to that here described; if there are marked differences, they may be accounted for by the climate and the nature of the inhabitants among whom it occurs. An epidemic of pellagra could not occur in the West Indies, while proper food is as easily obtainable as at the present time (if pellagra is a disease of improper feeding). Thus the occurrence of the few cases which are here described is far more indicative of the nature of the disease than the appearance of an epidemic. In these cases maize could have had very little to do with the disease, for large quantities of maize are seldom eaten by these inhabitants.

A vicious cycle appears to be established; once the disease starts the patient loses all appetite, and desires farinaceous food more than meat or fish.

To discuss the question as to what bodies are exactly lacking in the food is obviously impossible, unless a large amount of research work is done, such as has been carried out on beri-beri in the Far East.

Beri-beri, the scurvies, and I would add tropical pellagra, appear to form a natural group of "food diseases," and research concerning them will be productive of a great addition to our knowledge of dietetics.

It may appear that I am somewhat dogmatic in asserting this condition to be due to improper food (or a lack of food), but I question if any other indication can be drawn from these nine cases. The history, symptoms, morbid anatomy, and microscopical appearance all point in one direction. If these are to be considered as caused by a germ, that opinion must be formed without a single factor, as far as I can elicit, pointing in that direction.

In this series of nine cases only two were men, one of these being alcoholic, the other not.

Only three of these nine were alcoholic, and their drinking had not been caused by the mental depression of the disease.

A similar atrophy of the organs of the body is seen in no other disease caused by micro-organisms.

As it is almost a usual condition for labourers in the tropics, who have been infected with malaria and always harbour intestinal parasites, to run a slight intermittent temperature due to one or other of these causes, it must be considered that the temperature in this series of cases was remarkably low.

THE METEOROLOGY OF MALARIA.

By MATHEW D. O'CONNELL, M.D.

IN continuation of the remarks on this subject in the JOURNAL OF TROPICAL MEDICINE, February 15, 1912, I give below the meteorological conditions at Allahabad, India, in September, 1906, when malaria was prevalent, as it is in all parts of India during the retreating monsoon period, except in the hills.

I take the following meteorological observations for September 15 to September 16 from the *Pioneer*, published at Allahabad on September 17, 1906:—

Allahabad, 1906		Dry bulb temperature of air, F.	Relative humidity of air, per cent.
September 15,	4 p.m.	84.7°	74.0
,, ,,	10 ,,	80.5	91.0
,, 16,	6 a.m.	77.3	93.0

From these records it is seen that the dry bulb temperature of the air fell from 84.7° F. at 4 p.m. to 80.5° F. at 10 p.m. on September 15, or at the rate of 0.7° F. per hour, and during the same time the relative humidity of the air rose from 74 to 91 per cent., or at the rate of 2.83° F. per hour. Again it is seen that the dry bulb temperature of the air fell from 80.5° F. at 10 p.m. on September 15 to 77.3° F. at 6 a.m. on September 16, or at the rate of 0.4° F. per hour, and the relative humidity of the air rose, during the same time, from 91 to 93 per cent., or at the rate of 0.25 per hour.

From these figures we can construct a table, as under, showing the meteorological conditions for each hour of the night of September 15 to September 16, 1906, at Allahabad.

Allahabad, 1906		Dry bulb temperature of air, F.	Relative humidity of air, per cent.
September 15,	4 p.m.	84.7°	74.0
,,	5 ,,	84.0	76.2
,,	6 ,,	83.3	79.6
,,	7 ,,	82.6	82.4
,,	8 ,,	81.9	85.3
,,	9 ,,	81.2	88.1
,,	10 ,,	80.5	91.0
,,	11 ,,	80.1	91.2
,,	12 midnight	79.7	91.5
September 16,	1 a.m.	79.3	91.7
,,	2 ,,	78.9	92.0
,,	3 ,,	78 5	92.2
,,	4 ,,	78.1	92.5
,,	5 ,,	77.7	92.7
,,	6 ,,	77.3	93.0

That exposure to an atmosphere such as that of which details are given above, for fourteen hours, will increase body temperature becomes evident when we compare the details with those of the atmospheres found by actual observation to raise body temperature in the humid cotton-weaving sheds in Lancashire, as given below.

Observation	Atmospheric conditions which raised body temperature in the cotton sheds		Degree F. to which body temperature was raised and pulse and respiration increased by exposure in the cotton sheds		
	Dry bulb, F.	Relative humidity, per cent.	Temperature in mouth, F.	Pulse	Resp.
1	85.0°	64.0	100.4°	120	24
2	84.5	68.0	100.3	130	25
3	84.0	68.0	100.3	84	25
4	83.5	72.0	100.1	100	20
5	83.0	64.0	99.3	92	16
6	82.0	72.0	99.2	88	14
7	81.5	72.0	100.2	112	25
8	81.0	72.0	100.0	112	31
9	80.5	65.0	99.6	92	20
10	80.0	75.0	99.2	92	28
11	79.5	75.0	100.2	90	24
12	79.0	73.0	100.3	110	24
13	78.5	75.0	99.6	116	22
14	78.0	77.0	100.0	100	30
15	77.0	79.0	100.1	100	18

We see from these figures that whilst the hourly dry bulb temperatures of the atmosphere throughout the night of September 15 to September 16, 1906, at

Allahabad were practically the same as some of those of the atmosphere which raised body temperature in the cotton sheds, the humidity of the atmosphere at Allahabad was much greater than the humidity in the cotton sheds. Hence exposure to the night atmosphere at Allahabad in September must raise body temperature more than exposure to the atmosphere in the cotton sheds did. For example, in the fourth observation in the cotton sheds, given above, body temperature was raised to 37.8° C. (100.3° F.), the pulse to 110, and the respirations to 24, by exposure to an atmosphere having a dry bulb temperature 26.1° C. (79° F.) and a relative humidity of 73 per cent. But the atmosphere at Allahabad at 2 a.m. on September 16, 1906, had a dry bulb temperature practically the same, 26° C. (78.9° F.), and a relative humidity of 92 per cent. The latter atmosphere must raise body temperature more than the former, if only from the fact that it presents a greater impediment to loss of heat from the body. But the atmosphere in the fourth observation in the cotton sheds raised body temperature to 37.8° C. (100.3° F.).

It is to be regretted that malariologists never discuss the effect of exposure to the night atmosphere, under which malaria becomes prevalent, on body temperature. When they do mention meteorological conditions at all it is usually in the briefest manner, and then only to point out their effect on mosquitoes and their larvæ, or on the malaria parasites. One distinguished malariologist says: "One of the most important conditions necessary to the elaboration of the extra-corporeal phase of the malaria germ is a sustained average temperature of at least 60° F.," and he then dismisses the subject in six lines. Referring to humidity, he declares it to be an important condition for producing breeding places for anophelines, and then dismisses the subject in twelve lines. Another distinguished malariologist says that in temperate climates malaria appears only in the warm season, that oöcysts grow best at from 20° C. (68° F.) to 30° C. (86° F.), and are killed by temperatures below 16° C. (60.8 F.). Atmospheric moisture, he adds, plays a most important part in the prevalence of malaria, and he then dismisses the subject in five lines with the remark that it (moisture) is necessary for the development of the eggs and larvæ of anophelines. A third distinguished malariologist tells us that mosquitoes cannot breed without water, though the adult insect can live without it for months in a dense undergrowth. But nowhere do malariologists refer to the effect of the warm or hot damp atmosphere, under which malarial fever becomes prevalent, in raising the body temperature of those immersed in it, although distinguished physiologists have for years pointed out the effect of similar degrees of atmospheric heat and moisture in raising body temperature, and this effect is plainly demonstrated in the Report of the Departmental Committee on Humidity and Ventilation in the Humid Cotton-weaving Sheds of Lancashire.

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THE JOURNAL OF

Tropical Medicine and Hygiene

AUGUST 15, 1912.

BRITISH MEDICAL ASSOCIATION.

SECTION OF TROPICAL DISEASES, Wednesday, July 24, 1912.

Abstract of Papers and Discussions.

PAPERS ON TRYPANOSOMES.

(I) J. W. W. STEPHENS, M.D.Cantab., and H. B. FANTHAM, D.Sc.London, B.A.Cantab., contributed a paper on *Trypanosoma rhodesiense* (Stephens and Fantham). The authors, who discovered the parasite, termed the *T. rhodesiense* "a second species of African trypanosome, producing sleeping sickness in man."

Dr. Stephens gives an interesting account of the discovery of this parasite. It seems that in 1910 a case of sleeping sickness from Rhodesia was being treated in the Royal Southern Hospital, Liverpool. At a date subsequent to the admission of this patient, Dr. Stephens, whilst demonstrating the trypanosomes of the blood of a rat, noticed that the trypanosomes differed from the ordinary *T. gambiense*, and on making inquiries found that the rat from which the specimen he was using had been taken had been inoculated from the Rhodesian case of sleeping

sickness. So positive was he of the marked difference in the trysanosomes in question that he followed the subject up, and with the assistance of Dr. H. B. Fantham succeeded in demonstrating a new species of trypanosome, with many differences as regards appearance and virility from *T. gambiense*. Morphologically the peculiarity of the *T. rhodesiense* is that, in the blood of subinoculated animals, the nucleus in trypanosomes of a short type is near the posterior end, close to, or sometimes even behind the blepharoplast, instead of at or near the centre, as in other trypanosomes.

This feature is sufficient in the opinion of the discoverers to definitely distinguish the trypanosome in question.

The virulence of *T. rhodesiense* compared with *T. gambiense* is most marked, for whereas in a number of different animals experimented upon the former when inoculated caused speedy death, the latter seemed to cause few signs, and recovery was the rule.

Stephens and Fantham in the conclusion of their paper state:—

Conclusion.

When we first announced this trypanosome it seemed to be very generally assumed that it was a variety of *T. gambiense*, and that its peculiarities were due to the fact that it was probably transmitted by *Glossina morsitans*. We have never held this view, as we considered that there were no facts to warrant such an assumption. We believe that sleeping sickness in Rhodesia, Nyasaland, and adjoining territories is due to a specific trypanosome, *T. rhodesiense;* that the disease is not due to *T. gambiense* recently introduced, on the contrary—though this may be difficult to prove—that it has existed in these territories from time immemorial.

(II) F. K. KLEINE (German East Africa) contributed a paper on "The Identity and Mode of Transmission of Trypanosomes." Koch postulated a period of mutability of trypanosomes, but in Kleine's opinion the period of mutability is passed. We have now sharply defined groups, differing in their pathogenicity and other biological properties, and in no case has it been proved possible to fundamentally alter the whole character of a strain. All attempts also to alter the specificity of trypanosomes in the body of Glossinæ have proved fruitless; and as the specificity of trypanosomes is marked in many cases, inoculations in various animals suffice to establish their identity. Kleine concludes from his experiments that when using a technique free from all objections, subcutaneous injection of a particular species of animal with trypanosome-holding blood, proves whether that species is insusceptible or not. The examination of fresh specimens of blood is important, for the mobility of species differ as well as of individuals of the same strain. *T. cazalboui* are characterized by quite remarkable rapidity of motion, so much so that by the great activity of its movement, as seen in the field of the microscope, this parasite can be at once declared to be neither *T. brucei* nor *T. gambiense*, nor in fact any other known variety. The size of a trypanosome is not sufficient to determine its identity, for the individuals of one and the same strain vary in themselves in size, and as yet there is no correspondence in methods of fixation and measuring. Laveran's suggestion to test the identity of trypanosomes by cross inoculations of immunized animals has the disadvantage that it takes a long time to execute, and also in many animals an immunity cannot be produced against the trypanosomes highly pathogenic for that particular animal.

Kleine found serum reactions of use in distinguishing *T. brucei* from *T. gambiense*, but the serum specific for *T. brucei* did not protect against *T. gambiense*, even in repeated doses.

Identification of the pathogenic trypanosomes in mammalia is not possible in the tsetse-fly; but trypanosomes derived from cold-blooded animals can be distinguished from those of warm-blooded animals. In Glossinæ, trypanosomes would seem to pass through a sexual development; in the fly, two different types of trypanosomes appear in juxtaposition, and it is almost certain that they are male and female, they are distinguishable by staining differently; the male (?) is thin and slender, the female (?) broader and possesses two or more nuclei. The discovery by Minchin and Thompson of intracellular stages of *T. lewisi* in the rat-flea is of special scientific interest, and it may prove to be the beginning of a clearer elucidation of the still obscure developmental processes.

In regard to transmission it is now fairly well determined that the mechanical transmission of sleeping sickness is only an exceptional occurrence; and it is practically settled that a fly which has once become infective remains so for the rest of its life.

G. palpalis can no longer be regarded as the sole transmitter of sleeping sickness, for in German East Africa, in the district of the Rovuma River, at least a dozen cases of the disease have been met with, although only *G. morsitans* exists in the district.

(III) F. MESNIL, Institute Pasteur, Paris, in a paper entitled "*T. rhodesiense* and *T. gambiense*," confirms the observations of Stephens and Fantham concerning the *T. rhodesiense* and its marked virulence. He considers that there is a marked differentiation between the two human trypanosomes of Africa, and that the creation of a new species for the trypanosoma of Rhodesia is legitimate. Mesnil, however, from his experiments and observations, regards *T. gambiense* and *T. rhodesiense* more closely allied to each other than any other two known species of trypanosomes. Of several important observations the following are significant: Of vertebrates regarded as refractory or little susceptible to *T. gambiense*, no difference was found when submitted to infection by *T. rhodesiense*. Cynocephalus is refractory to both *T. gambiense* and *T. rhodesiense;* and with either virus, abortive injections only were encountered in *Cercocebus fuliginosus* (Mesnil and Ringenbach). Pigs, with either virus, showed a slow infection ter-

minating in recovery (Mesnil and Blanchard). Laveran has shown that a goat immunized for *T. gambiense* could be infected with *T. rhodesiense;* and Seger and Mesnil have inoculated mice which had recovered from an infection of *T. rhodesiense* (after treatment with arsenophenylglycin) with *T. gambiense.* The delay in the controls attaining complete recovery they interpreted as a proof of the relationship of the two strains. Ringenbach and Mesnil tried cross experiments as regards protection, trypanolysis and attachment with the sera of Congolese sleeping sickness patients and animals showing a chronic infection with *T. gambiense* and *T. rhodesiense;* the majority of their results favour a differentiation of the two types.

(IV) ALLAN KINGHORN and WARRINGTON YORKE communicated a paper dealing with "Trypanosomes infecting Game and Domestic Stock in the Luangwa Valley, North-eastern Rhodesia." They remark that domestic stock is extremely scarce in the Luangwa Valley district, and they ascribe the deficiency to the ravages caused by the *G. morsitans.* The economic importance of this fact needs no comment. The examination of game showed that at least 50 per cent. were infected with trypanosomes in the vicinity of Nawalia, where the observations were made. Double infections in game are not uncommon. The ultimate effect of infection of game by the several parasites has not yet been determined; all the animals shot appeared in good health; but it would seem that the tolerance of infection must be considerable, for in the case of buck their number have steadily increased. In the summary of their interesting paper the authors state:—

(*a*) Trypanosomes are of frequent occurrence in game and domestic stock in the Luangwa Valley. At least 37·5 per cent. of the buck harbour parasites.

(*b*) Six species of trypanosomes were found, viz., *T. rhodesiense, T. vivax, T. nanum, T. pecorum,* and two others, of which one was possibly *T. montgomeryi.*

(*c*) *G. morsitans,* in nature, transmits two of these trypanosomes, viz., *T. rhodesiense* and *T. pecorum,* and probably also transmits at least two others, viz., *T. vivax* and *T. nanum.*

(V) G. B. WOLBACH, M.D., and C. A. L. BINGER (Boston, U.S.A.) in a paper entitled: "A Contribution to the Pathological Histology of Trypanosomes," deal with the distribution of trypanosomes in tissues, and the factors concerned in the production of the lesions in trypanosomiasis. The most interesting part of the paper deals with the distribution of trypanosomes in tissues. They state: (1) That trypanosomes leave the vessels and are found in the tissues of all organs, showing, however, a decided preference for connective tissue structures. (2) That the lesions of trypanosomiasis, including focal infiltrations in the parenchymatous organs, the infiltration of the meninges, peri-vascular infiltration of the brain and other organs, and the œdema and subsequent changes in the skin and underlying tissues are due to the presence of the trypanosomes in the affected tissue. The authors consider that the preference of trypanosomes for connective tissue structures heightens the numerous analogies between trypanosomiasis and syphilis. As regards the morphology of trypanosomes in tissues, the authors found that although the typical flagellated form predominated, rounded forms were found mostly within endothelial leucocytes. They regard the rounded forms as partially destroyed trypanosomes, and that most of such forms go on to complete destruction would seem probable from the fact that within the endothelial leucocytes and giant cells many inclusions of a chromatin nature were met with.

The paper was accompanied by many lantern slides of high teaching value.

(VI) ALDO CASTELLANI, Director of the Government Clinic for Tropical Diseases, Colombo, Ceylon, contributed a paper on "Copra Itch." Copra is derived from the dried kernels of coco-nuts. After exposure to the sun for a couple of days a portion of the kernel crumbles away, producing the copra dust. The skin lesions copra produces resemble those of scabies; pruriginous papules, pustules and furuncles are seen, and as the result of scratching bloody crusts are present. Castellani is of opinion that the disease is produced by sarcoptes of apparently an undetermined species. The sarcoptes can be seen as white minute bodies moving about amongst the copra dust. Experimentally when the insects are not present in the dust no skin lesion is set up, but when they are present in the dust or when the insect alone without the dust is placed on the skin a dermatitis may be occasioned.

The part of the skin first affected is usually the hands, but the lesions may spread all over the body, except the face; no burrows or cuniculi were observed.

The treatment recommended is: Beta-naphthol 30 gr., balsam of Peru 60 gr., vaseline 1 oz. The ointment is applied at night after a hot bath.

(VII) Fleet-Surgeon BASSETT-SMITH communicated a paper on "Blood Determination in a Case of Katayamin Disease." The disease was contracted in Hankow, China, in June, 1911; early fever was present, followed by irregularity of the bowels and anæmia. The white corpuscles increased in numbers: October 14 (1911), they amounted to 16,000; November 10, 25,000; December 14, 24,000; January 1, 1912, 28,000. The characteristic ova were found in the stools. After a short residence in England the disease disappeared.

(VIII) Dr. ALDO CASTELLANI (Ceylon) contributed "A Note on the Importance of Hyphomycetes and other Fungi in Tropical Pathology." After pointing out the immense amount of work done in the investigations of bacteria and of animal organisms in relation to tropical pathology more especially, Dr. Castellani drew attention to the part vegetable parasites may and do play in the etiology of diseases. He points out that vegetable parasites may attack any organ and

system of the human being, and described the following which he has met with in the Tropics:—

(1) *Nervous System.*—In 1904 he cultivated from the pus of a cerebellar abscess a streptothrix, which was Gram-positive and acid-fast. In all media in which the streptothrix was grown the colonies had a black pigmentation.

(2) *Eyes.*—In two cases of conjunctivitis, he found endomyces.

(3) *Nose.*—In the discharge from the nose of a native (Ceylon) boy, minute black dots were seen in the mucus. These were proved to be due to *Aspergillus niger.*

(4) *Ears.*—(*a*) In material removed from the ear, he found an endomyces, which he has called *Endomyces rhoi.* (*b*) In the meatus of two boys (horse keepers), a fungus belonging to the family Mucoraceæ was found. The fungus was proved to be the *Lichtomia ramosa* (*Lancet*, 1886), which has been often found in the nasal mucus of horses. Castellani finds for the various forms of otomycosis that syringing the ear with hydrogen peroxide two parts to alcohol one part is efficacious.

(5) *Alimentary Canal.*—(*a*) Myotic affections of the tongue are associated with fungi of several kinds; and the author is of opinion that in thrush the term *E. (oidiam) albicans* covers a number of different species. (*b*) In sprue, he finds in the stools and on the tongue fungi in abundance. To several varieties of intestinal hyphomycetes he has given the names of *E. entericus, E. fæcalis, E. intestinalis, E. rotundus.* He has, moreover, found at least three of these in normal stools, and in persons suffering from other ailments. It is possible that at least the frothiness of the motion is due to the presence of these fungi.

(6) *Respiratory Organs.*—The cases of bronchomycosis Castellani has observed in Ceylon: (1) Fungi of the Genus *Endomyces oidium;* (2) *aspergilli* and *penicillii;* (3) streptothrix and actinomyces; (4) *Rhizomucor parasiticus* and *Lichtheimia corymbifora.*

"Tea factory cough," present amongst coolies working in tea factories and tea-tasters who sniff the dry tea in testing its quality, is associated with the presence in the nasal mucus of the following fungi: (1) *Endomyces;* (2) *Aspergillus* and *Penicillium*; (3) and a streptococcus (not *S. pyogenes*). Of many forms isolated from the sputum of cases of "tea factory cough," two, named *E. tropicalis* and *E. paratropicalis*, he considers pathogenic.

(7) *Genito-urinary Tract.*—From cases of urethritis with black discharge a fungus possibly *Aspergillus niger*, but resembling in its cultural characters the fungus formed in *Tinea nigra* (*Foxia mansoni*), was isolated. Aspergillosis and penicilliosis of the vulva and vagina are met with; and actinomycosis and sporotrichosis of both male and female genitals may occur.

(8) *Tropical Dermatomycoses.*—Castellani gives an extended table divided into fourteen heads. He deals with the following at greater length: (*a*) Dhobie itch: He is of opinion, although the fungus most frequently found in Dhobie itch is the *Tinea cruris*, nevertheless that the disease is caused by several different species, each of which gives rise to slightly different clinical states. Four of these he has styled *Epidermophyton cruris, E. pernetti, E. rubrum, Trich. nodoformans.*

Tinea flava is usually confused with *Pityriasis versicolor* which it closely resembles microscopically. *Tinea flava* occurs on the face, where pityriasis is never met with.

Tinea nigra produces black patches due to a fungus termed by Castellani *Foxia mansoni.*

Tinea imbricata is, according to Manson's early researches (1872), caused by a trichophyton-like organism; the disease has also been recently considered to be due to an aspergillus-like fungus, but Castellani has shown that this is not the case. He considers the fungus belongs to a genus he has established, namely *Endodermophyton*, of which he has found two species, *E. concentricum* and *E. indicum.*

(IX) Dr. CHARLES W. DUVAL (U.S.A.) contributed a paper styled "A Consideration of the Organisms cultivated from the Lesion of Human Leprosy, with reference to their Etiological Significance."

After a review of the literature, Dr. Duval is convinced that several apparently different germs have been described as the causal agent of leprosy, namely: (1) a non-acid-fast diphtheroid (Kedrowski), (2) an acid-fast chromogenic bacillus (Clegg), (3) non-acid-fast and acid-fast interlacing and filamentous streptothrix (Rost and Williams), and (4) a permanently acid-fast bacillus which *in vitro* maintains the morphology of the Hansen bacillus of the tissues and grows under artificial conditions only in the presence of special nutrients (Duval).

More recently Bayon (1912) describes a non-acid-fast diphtheroid obtained from a leper which behaves in a like manner to Kedrowski's culture, *i.e.*, the initial growth from the tissues is non-acid-fast and a diphtheroid until passed through rats, after which it permanently changes into a typical acid-fast bacillus. Like Rost and Williams he also mentions streptothrical forms in his culture. He concludes that not only is his culture identical with Kedrowski's but also that it is the cause of human leprosy, basing his argument upon specific reactions obtained with human leper serum and also upon the production of characteristic lesions in laboratory animals.

Dr. Duval's conclusions are: That there may be cultivated from the leprous lesion two types of acid-fast bacilli which have distinct characteristics; one an organism which after it has become accustomed to a saprophytic existence produces pigment and becomes extremely pleomorphic; the other a bacillus growing slowly and only upon special media, retaining its tinctorial and morphological character throughout the period in which it has been under observation (two years).

The strain which subsequently becomes a rapid grower and chromogenic shows a wide variation in morphology and in its ability to retain the stain when subjected to decolorizing agents. At times and under certain conditions the individual bacilli are diphtheroid, streptothrical and non-acid-fast. The slow

growing non-chromogenic culture is always acid-fast and can be sharply differentiated from the chromogenic culture by its growth features.

The animal experiments undertaken for the purpose of differentiating the acid-fast organisms recovered rom the human leprous lesion and fixing their etiological status are not regarded as conclusive. The serological tests, especially those performed with highly immune sera, are of some value and suggest that the leprosy bacillus of Clegg is not closely related to the saprophytic acid-fast chromogens, and that the non-chromogenic slow-growing culture from leprosy is different, both from Clegg's isolation and from all known species of acid-fast bacilli.

The *rôle* played by the chromogenic bacillus of Clegg in the production of leprosy is as yet an unsettled question.

The non-chromogenic strain, while behaving according to most of our notions regarding a pathogenic organism, has likewise not up to the present been proven to be the cause of leprosy, although I am impressed with the probability of such a *rôle* being eventually attributed to it, and consider that it deserves more serious attention than any strain so far cultivated from the human leprous lesion.

The wide variation in morphology and staining reaction for certain cultures recovered from the human leprous lesion, which subsequently become rapid growers and chromogenic, might account for the interpretations of Kedrowski, Rost, Williams, Bayon and others that *B. lepræ* is a bacterium of such pleomorphism that it can be recognized as a non-acid-fast diphtheroid, or streptothrix, and as an acid-fast bacillus.

(X) Dr. M. G. MARCHOUX sent a paper on "The Problem of Leprosy." He asks the question are we in Europe threatened by an active recrudescence of leprosy? He points out the danger of infection from the increased intercourse between leprous countries in the tropics and Europe. Although animals are not capable of experimental infection by the bacillus of leprosy, he has studied a disease of rats which presents a remarkable resemblance in many ways to leprosy. The clinical symptoms and the behaviour of the bacillus in the rat and man are in many points apparently identical, yet the two bacilli appear to form two varieties of the same species. In rats the disease is readily inoculable; it suffices to place the bacilli on the epidermis and scarify the part or even simply on the skin newly shaved. Marchoux is of opinion that the disease is communicated to rats by rats biting other rats, and not by insects or any parasite. He is of opinion that leprosy in man may remain latent in one or several glands, and the bacilli might not leave the glands except in the presence of a secondary infection or bodily decay; in other words, leprosy may be more prevalent than one thinks, as it may lie dormant for many years, or may never occasion the usual signs and symptons met with in declared lepers.

(XI) Dr. H. BAYON, London, read a paper entitled "The Leprosy Cultures of Clegg, Duval, Kedrowski, Rost, Williams, and their Identification: a Comparative Experimental Study." He summarizes his remarks as follows:—

(1) Histological, serological and clinical evidence lead us to believe that the organism of leprosy is a slowly multiplying, very slightly toxic bacterium of the so-called "tubercle" group.

(2) Acid-fast saprophytes are so ubiquitous that the cultivation of such from cases of leprosy does not necessarily prove their relationship to the disease in man, but requires much further identification in order to attest their true significance.

(3) With the exception of Kedrowski's, no leprosy culture published so far has been sufficiently identified to enable the statement to be made that its properties and appearance are identical with those of the morphological entity called "Hansen's bacillus"; because only Kedrowski's culture has produced lesions in animals absolutely identical with those found in leprosy of human beings and rats.

(4) The author's cultural and animal experiments lead him to believe that Kedrowski's culture is true leprosy, and that his view of the varying morphology of this organism in artificial cultures is correct.

(5) All other cultures appear to belong to the group of acid-fast, chromogenic, rapidly growing saprophytes such as have been found in butter, milk, dung, tap-water, earth, &c. Their relationship to leprosy is not clear.

(6) It has been possible to confirm that the acid-fast organism cultivated from rats causes lesions identical to those of spontaneous rat leprosy.

(7) Leprosy has been transmitted by the author directly from the human being to the rat, and been carried on to the second generation and causing typical lesions in the spleen and the liver.

(XII) Professor GEORGE DEAN remarked that the investigation of the subject of human leprosy from the study of rat leprosy may prove of value. It is difficult to accept Duval's chromogenic organism as the cause of leprosy; the free growth on ordinary media at low temperatures, and its morphology, do not suggest that it is the leprosy bacillus he is dealing with.

(XIII) Dr. MINETT (British Guiana) stated that the cultures he had made always contained acid-fast bacilli and cocci but never streptothrix. Experimental infection of animals always proved negative; and all treatment by vaccine, by nastin and by *B. chloride*, was without result.

(XIV) Dr. BAYON, in replying to criticism, said that the simple cultivation of an acid-fast organism from cases of leprosy does not prove its relationship to the disease until the culture can produce by injections into animals the leprous lesions found in visceral leprous affection in man.

(XV) Captain W. S. PATTON, I.M.S., contributed a paper on "The Kala-azar Problem." He recognized that there were three main points to be considered

in connection with the successful investigation of the kala-azar problem :—

(1) The thorough mastery of insect technique in connection with insect feeding experiments under artificial conditions.

(2) The cultivation of the parasite *in vitro*. The parasite of kala-azar will develop into a flagellate in several kinds of media in test tubes, and it can be maintained in this condition for a long time, also it is known that, as Dr. Row discovered, the O body develops into the flagellate, and from the flagellate back to the O body, but this does not help us much in ascertaining the methods of transmission of these parasites in nature.

(3) The clue to the solution of the kala-azar problem lies in the study of the flagellate, of the genus herpetomonas. The parasite of kala-azar is a true insect herpetomonas, and will only develop into a flagellate in the bed-bug, the *Cimex rotundatus*. When the parasites had flagellated in these bugs, and the latter again fed either on a case of kala-azar or on a monkey (*Macacus sinicus*), the flagellates degenerated, and disappeared within twelve hours ; on the other hand, in those bugs which had only fed once on the case, the flagellates went on multiplying, and every bug contained large numbers which actively multiplied from the fifth to the eighth day. By the twelfth day they had all practically reached the post-flagellate stage, and were only found in the stomach of the bug. This is an observation of fundamental importance, for if we are to attempt the transmission of the parasite by the bed-bug, repeated feeding will defeat the end in view. Experimental transmission of the parasite is impossible, for we know of no animal at present that is susceptible.

(XVI) Dr. R. Row, Petit Laboratory, Bombay, described "Some Experimental Facts *re* Kala-azar (Indian)." Dr. Row described the results obtained by infecting the monkey (*Macacus sinicus*) cutaneously and subcutaneously with an original virus and an old culture derived from the original virus. His experiments demonstrated the following interesting results :—

(1) By the cutaneous injection of the virus of kala-azar from a human source, it is possible to induce a cutaneous lesion in a susceptible animal—*e.g.*, *M. sinicus*, the incubation period in this case being about nine weeks.

(2) By the subcutaneous injection of a three weeks' old culture of *Leishmania donovani* in N.N.N. medium, it is possible to induce a subcutaneous lesion in a susceptible animal—*e.g.*, *M. sinicus*, the incubation period in this case being about five months.

(3) Parasites resembling those found in the human tissues are found in fair abundance in these lesions artificially induced cutaneously and subcutaneously—these parasites being also culturable into flagellates in suitable media.

(4) It is not possible at present to say how far these lesions will lead the animal—*i.e.*, whether these will ultimately get absorbed without causing a general infection, or whether they will ultimately lead to a general invasion by the parasite—although from the localized nature of the nodules, their free mobility and the general good condition of the animals, it looks as though they are going to be only local.

(5) The bearing of these lesions on the possible results of a cutaneous infection by biting insects, which might act as transmitters, is interesting.

(XVII) H. B. Fantham, D.Sc. (Liverpool School of Tropical Medicine), contributed a paper on "Some Insects and Flagellates and the Problem of the Transmission of Leishmania." Dr. Fantham described certain of the protozoal organisms which may occur in the alimentary tracts of blood-sucking insects such as fleas, lice and mosquitoes, all of which have been suspected of transmitting various species of Leishmania. The presence of insect flagellates complicates the problem for the human flea ; *Pulex irritans*, both adult and larva, has been shown in England to harbour a flagellate in its digestive tract ; in the case of the dog flea *Ctenocephalus canis* flagellates have also been found. In human lice (*Pediculi vestimenti*), in England, Fantham found a flagellate, *Herpetomonas pediculi*, in the digestive tract and showed that the organism passes through pre-flagellate, flagellate and post-flagellate stages. In *Pediculis capitis* also, Fantham found *herpetomonads*. In mosquitoes, Culex and Anopheles, *herpetomonads* are known to occur ; in the gut of *Phlebotomus tropica*, Wenyon found a *herpetomonad* in Aleppo. In house flies *herpetemonas Muscæ domestica* have been demonstrated in the digestive tract. All the flagellates named pass through Leishmania-like stages, which must not be mistaken for Leishmania itself, for a flagellate herpetomonad closely resembles the flagellate forms of Leishmania.

(XVIII) Dr. H. Seidelin (Liverpool) stated that from Mexico, Brazil, the Guianas, and Panama several cases of Leishmaniasis have been reported. In Yucatan (Mexico), Dr. Seidelin found cases widely spread and occurring especially amongst collectors of the raw material from which chewing-gum is prepared. Amongst the collectors (chicleros), an affection of the pinna of the ear is so common that it has been termed the "ear-ulcer of the chicleros" ; ulcers of the same type are found also on the forearms and legs of persons thus affected.

(XIX) Professor Madden (Cairo), contributed "Notes by Professor A. R. Ferguson on the Specimens prepared by him from Cases of Parasitic Granuloma occurring in Egypt," in which it is recorded that the Leishman bodies are more elongated than those found in internal manifestations of kala-azar, and are found especially at the periphery of the lesions. They occur also in the blood taken from the vicinity of the sores, but not in peripheral blood from other parts nor from splenic puncture. In the central part of the sore no parasites were found ; and in very chronic and particularly in septic lesions the parasites were absent.

Professor Madden mentioned that in lesions which he styled papilliferous degeneration of the skin Ferguson and Richards found *L. tropica*.

(XX) Dr. ANDREW BALFOUR (Wellcome Laboratory, Khartoum) said he had found no evidence of flagellate infection in bed-bugs in Khartoum, but observations of the kind require to be done on a large scale. He dwelt upon the danger of confounding mere cultural changes in the insect intestine with a true developmental cycle.

Dr. Balfour related a recent observation by Captain Archibald, who found definite granule shedding in flagellates from cultures of *L. tropica*, using the dark field method.

Fry had made similar observations in the case of trypanosomes, and, although the significance of this phenomenon has not yet been determined in the case of flagellates, it is possible that work along these lines may help to solve the problem of transmission in Leishmaniasis as in other protozoal infections.

(*To be continued.*)

Annotations.

The Pathology of Chyluria.—In the *Journal of the London School of Tropical Medicine*, vol. i, part 3, July, 1912, G. C. Low contributes a very important paper on the pathology of chyluria. His paper materially alters the general conception held of that condition, and shows further that it is quite incorrect to talk of all cases of milky urine under that name. He was led to this conclusion, firstly by the examination of the urine of a case diagnosed as chyluria, but which, on the usual tests being applied, showed practically no traces of fat in it, and secondly, by being fortunate enough to obtain an autopsy on a similar case in a man who died during the attack. The morbid appearances found in this case were very instructive and important. The thoracic duct was normal from beginning to end, and nothing was found that could in any way obstruct the passage of the chyle up it. On the other hand, obstruction existed in the lymphatics of the kidneys, ureters, and bladder, causing varicosity of these structures and a consequent escape of lymph and blood into the urine. This accounted for the fact of there being practically no fat in that fluid during life, the constituents being lymph and blood, and not the mesenteric lymph or chyle. The author believes then that it is erroneous to call all cases of milky urine chyluria. Before one can do so proper examination must be made to determine if an excess of fat is present or not. If this is not present then the leakage will be found to be coming from the urinary tract somewhere, and the proper name to give to such a condition will be *lymphuria* not *chyluria*, an excess of blood in either of these forming *hæmato-lymphuria* or *hæmato-chyluria* respectively.

Amongst other interesting features found at the autopsy were the presence of numerous calcified filariæ in the tunica vaginalis and pelvis of the kidney. There had been a heavy infection of these parasites at one time, but towards the end of the patient's life they had evidently died out, this fact also being attested to by the absence of embryos either in the blood, lymph, or other secretions of the body. The lesions in the vesiculæ seminales and prostate are specially instructive. So far, the author believes such changes have not been recorded before, and those observations, together with others on the mechanism of the block of the lymphatics of the lower limbs, urinary tract, &c., will help very materially in elucidating some of the doubtful points in the pathology of filariasis. The paper should be carefully studied in the original by those interested in the subject.

The Health of the Canal Zone.—Dr. John L. Phillips, Acting Chief Sanitary Officer for the Canal Zone, in his report of the department of sanitation for the month of May, 1912, states that the total number of deaths from all causes among employees was 33, divided as follows: Disease 19, and violence 14, giving the annual average per thousand of 4.61 and 3.40, respectively.

Among employees for the month of May of each year the annual average death-rate per thousand was as follows:—

1905, 16.65; 1906, 24.79; 1907, 30.15; 1908, 10.44; 1909, 9.45; 1910, 7.72; 1911, 10.89; 1912, 8.01.

The annual average death-rate per thousand in the cities of Panama, Colon, and the Canal Zone, including both employees and civil population, for the month of May of each year was as follows:—

1905, 41.95; 1906, 43.32; 1907, 31.57; 1908, 20.87; 1909, 15.77; 1910, 18.69; 1911, 22.32; 1912, 19.01.

In segregating according to race, the annual average death-rate per thousand from disease among employees was: For whites 1.95, and for blacks 5.50, giving a general average for disease of 4.61. For the same month during 1910 the annual average death-rate per thousand from disease among whites was 5.42, and blacks 4.55, giving a general average of 4.77; and in 1911 from disease among whites 5.81, and blacks 8.97, giving a general average of 8.17.

Among employees during the month deaths from the principal diseases were as follows: Bright's disease (chronic nephritis), 5; lobar pneumonia, 5; tuberculosis of the lungs, 3; disseminated tuberculosis, 1; cirrhosis of the liver, 1; malaria, 1; and organic disease of the heart, 1; leaving 2 deaths from all other diseases and 14 from external violence.

No cases of yellow fever, small-pox, or plague, originated on or were brought to the Isthmus during the month.

Plague at San Juan.—Martínez, Director of the Bacteriological Laboratory of the Service of Sanitation of Porto Rico, contributes a preliminary note on the epidemic of bubonic plague at San Juan to the *Medical Record*, July 13, 1912, p. 72. The origin of the outbreak was obscure, Martínez believing that the disease was introduced from Venezuela, not directly

but indirectly, by means of a port which was not in quarantine, without any human epidemic. Investigations made to determine whether there had been any increase in the death-rate of the rat population before the outbreak of the human cases showed that there had, many dead rats having been found in several warehouses on the "Marina" two or three months previously. Probably some of the first human cases were not diagnosed or were confused with other diseases. Among twenty-six positive cases there have been, up to June 29, seventeen deaths, which shows a mortality of 65.3 per cent. Of these seventeen deaths, fourteen occurred at San Juan, one in Arroyo, one in Carolina, and one in Loiza. Of the fourteen at San Juan, one was of pneumonic type and another of the septicæmic variety. The Department of Health have the matter well in hand, and Martínez believes that for this reason the frightful mortality of India will not be repeated in Porto Rico.

The Use of Ultra-violet Rays in the Sterilization of Water.—Major Clemesha, I.M.S., in the *Indian Medical Gazette* for July, 1912 (vol. xlvii., No. 7), writes on and gives descriptions of apparatus used for the sterilization of water by the ultra-violet rays. He states that at present there are at least two satisfactory sets of apparatus, both made by the Westinghouse Co. for sterilizing water, making use of the ultra-violet rays. These consist of (1) a small arrangement suitable for a single house or a small community, and (2) a much larger apparatus to be made use of in waterworks, giving very much larger yields per hour. In both these apparatuses the ultra-violet rays are generated by the Cooper Hewitt Lamp. This is very much like an ordinary vacuum tube, only in this lamp, when the current is running, the interior is filled with the vapour of mercury. Hence it is also commonly known as the "mercury vapour lamp." The ultra-violet rays will not penetrate ordinary lead or flint glass. This medium apparently cuts them off entirely; hence glass cannot be used in the manufacture of this lamp. Fused silica and quartz is the material used. This makes the lamp expensive, its price being £8. It should, however, be stated that if anyone is so unfortunate as to break a lamp, on no consideration should he throw away the pieces, as they are of considerable value. Furthermore, lamps that burn out and are not broken can be repaired. Major Clemesha also made a series of very stringent experiments, which showed the wonderful sterilizing power these rays possess. The advantages of the method he believes to be considerable. As he states, *no ordinary domestic filter* yet designed could give anything like 70 gallons per hour of absolutely sterile water. Seventy gallons of water could not be boiled probably for 2½ annas. No chemical is added to the water nor is the taste altered, and certainly anyone who has been accustomed to live on boiled water would be pleased to have a thoroughly sterile unboiled article rather than water sterilized by heat.

Report.

REPORT OF THE HEALTH OFFICER OF CALCUTTA FOR THE YEAR 1911.

By Frederick Pearse, M.D., D.P.H.

Dr. Pearse, in his very instructive Report on the Health of Calcutta for 1911, makes some very interesting proposals for the future. He thinks that in order to more promptly detect inefficiency of the filters or any source of contamination of the filtered water supply it is very desirable to establish a laboratory at Pulta and to keep an analyst there.

Further, in order to more efficiently purify the river water before filtration, and thereby to save the life of the filter beds in addition to enhancing the purity of the final effluent, he recommends the construction of additional sedimentation tanks at Pulta.

To complete the control over the slaughtering of animals intended for human consumption he urges the Corporation to establish a general slaughter house at Kidderpore, and for the same reason would discontinue the licenses of the two remaining private slaughter-houses.

In order to obtain better control and to ensure their management on higher sanitary principles he would again suggest the establishment of Municipal markets in the fringe area, Entally, Bhowanipur and Kidderpore; and he thinks that in order to supply filtered water more conveniently to the inhabitants of bustees some means should be found for placing standposts in the interior of these areas. The present system leads to the use of filthy tank water, is an obstacle to cleanliness and leads to recurring outbreaks of cholera.

For the suppression of the adulteration of food Dr. Pearse believes stringent measures are called for. There are certain articles of daily consumption the adulteration of which under any circumstances should be made a criminal offence—punishable, not only by a heavy fine, but even by imprisonment. At the present time the fines, which can only be occasionally inflicted, do not exercise any deterrent effect.

The compulsory construction of rat-proof floors in all places where grain and other substances used as food for men are stored is required, not only to prevent plague, but also other diseases.

Considering the value of the work done by the midwives of the Corporation more should be appointed. Each district covers a large area and a midwife cannot properly attend to cases scattered all over it. Dr. Pearse would recommend the appointment of an additional midwife for each district.

Lastly, the present position of the Laboratory is not satisfactory. The rooms open on to a busy public street largely traversed by hackney carriages. It cannot be kept clean nor properly ventilated, and work in it is detrimental to the health of the analysts. A Municipal Laboratory, while being central enough for convenience, should be removed as far as possible

from busy thoroughfares. As additional space is required in the central offices Dr. Pearse asks the Corporation to consider the proposal to establish the Laboratory on a more suitable site.

Notes and News.

An Exhibition of Appliances, Fittings, Materials and Products relating to Sanatoria, Tuberculosis Dispensaries, and the Treatment of Tuberculosis.—An Exhibition of special interest to medical officers of health and tuberculosis officers will be opened on August 26, 1912, at the offices of the Society of Medical Officers of Health, No. 1, Upper Montague Street, Russell Square, London, W.C. A comprehensive collection of exhibits has been carefully selected, ranging from economical methods of constructing sanatoria to the most recent improvements in diagnostic instruments. Several new designs in fixed and revolving shelters for tuberculosis patients will also be on view, and some new inventions of considerable importance from a public health point of view will be exhibited for the first time. A special section will be devoted to the heating and lighting of sanatoria, dispensaries, and institutions generally, and various economical cooking appliances designed for catering for large numbers will be submitted for inspection, together with laundry fittings, and various types of disinfectors. Numerous exhibits will deal with the preventative and curative aspects of the problem of tuberculosis in the United Kingdom, and in view of the importance of the matter from the point of view of the public health it is intended to keep the exhibition open for a period of twelve months, the exhibits being varied and added to as improvements occur. A detailed description of the Exhibition will be published in the September number of *Public Health;* meanwhile, any further information may be obtained on application to the Executive Secretary of the Society.

LONDON SCHOOL OF TROPICAL MEDICINE.

EXAMINATION RESULTS (THIRTY-NINTH SESSION, MAY TO JULY, 1912).

With Distinction.

Major W. P. Chamberlain (U.S. Army), M.D. (U.S.A.)
Captain W. Lapsley, I.M.S., M.B., R.U.I.
F. C. McCombie, M.D.Lond.
Captain H. Emslie Smith, I.M.S., M.B., Ch.B. Aber.
Major H. R. Price, I.M.S., M.B., F.R.C.S.E.
W. Allen, M.B., Ch.B., D.P.H. (Colonial Service).
S. L. Brohier, M.R.C.S., L.R.C.P., D.P.H. (Colonial Service).
W. J. Geale, L.R.C.P. & S.E.
J. E. L. Johnston, M.B., B.S.Lond., M.R.C.S., L.R.C.P. (Colonial Service).
A. H. Owen, M.R.C.S., L.R.C.P. (Colonial Service).
B. Spearman, M.B., B.C.Camb. (Colonial Service).

Captain W. F. M. Loughnan, R.A.M.C., L.R.C.P. & S.I.
J. F. Corson, M.D., D.P.H. (Colonial Service).
H. B. Rosair, L.M.R.C.P.I., L.R.C.D.S.
A. R. Neligan, M.D.Lond. (Foreign Office).
A. C. N. McHattie, M.B., Ch.B.Edin., D.P.H. Camb. (Colonial Service).
J. C. C. Hogan, M.D.Dub. (Colonial Service).
J. L. Gilks, F.R.C.S., L.R.C.P. (Colonial Service).
W. Telfer, M.B., Ch.B. (Colonial Service).
N. A. Dyce Sharp, M.R.C.S., L.R.C.P. (Colonial Service).
H. B. Blaker, State Diploma, Bengal (Indian Government).
A. Lionel Smith, M.B., M.R.C.P.
A. B. Arora, L.R.C.P. & S.Edin., L.F.P.S.Glas.
E. S. Marshall, M.R.C.S., L.R.C.P.
H. Fleming, M.B., B.Ch.Dub. (Colonial Service).
A. D. J. B. Williams, M.R.C.S., L.R.C.P. (Colonial Service).

RICE AND BERI-BERI IN BANGKOK.

NEARLY two years ago there was a good deal of beri-beri amongst the Customs guards at the different stations along the river. The use of polished rice was discontinued, and the only kind supplied was the undermilled variety known as No. IV. Siam, in which a large part of the phosphorus is retained. This is milled by the Borneo Company, Limited, to meet the demand that has arisen as a consequence of the accepted medical view with regard to beri-beri. During this period the cases of beri-beri averaged barely one a month.

From last December the use of white polished rice was again resumed, owing to the Borneo Company, Limited, ceasing to mill. Last month beri-beri again began to be noticeably present amongst the guards, and in one station containing just over two hundred men there were 19 cases last month. The loss involved in having a growing number of men on the invalid list is very considerable.

Notes on Books.

MARTINDALE AND WESTCOTT, in their preface to the fifteenth edition of their well-known work, the *Extra Pharmacopœia*, state that the subject matter has grown to such an extent in the last two years that it has become necessary to divide the work up into two volumes. Volume I. contains a description of the chemical and therapeutic properties of those Extra-Pharmacopœial chemicals and drugs which have attracted particular attention in the medical and scientific world, together with details of the methods of their manufacture and modes of administration, their medicinal uses, solubilities, pharmacy, and cognate data, with references to current

literature. Volume II. embodies analytical and experimental work, a large amount of which has been carried out in the laboratory of one of the authors. It also contains *résumés* on beri-beri, cancer, diphtheria, gonorrhœa, leprosy, malaria, plague, pneumonia, syphilis, trypanosomiasis, tuberculosis, typhoid, typhus, &c.

The necessity of a new edition so soon, and the extension of the material into two volumes shows how the subject goes on growing. As has been said so often before, the work is an extremely valuable one, and no one can really afford to be without a copy of it.

SEASICKNESS AND HEALTH. A manual for travellers. By Joseph Byrne, M.A., M.D., LL.B. London: H. K. Lewis, 136, Gower Street, W.C. 1912.

In this little book a number of useful hints are given to those proposing a voyage on the sea. The subject is one of great importance, and to those afflicted one of more than passing interest. Dr. Byrne believes that experiments conducted by him have shown that seasickness is caused by repeated, irregular stimulation of the vestibular nerve, and that the influence of the imagination as a cause has been much exaggerated. As regards treatment the author believes that the present methods are unsatisfactory and are a reproach to the medical profession. It is somewhat difficult, however, to understand how the list of the chief things to be avoided, given by the author, can ever be avoided. Most are part and parcel of the ship and must be put up with the best as one can. So far drugs have not proved very satisfactory, and the antimermal mentioned by the author will no doubt fall into the same category. People who are subject to very bad seasickness should stay at home; that is all there is to be said about the matter.

Personal Notes.

INDIA OFFICE.

From June 17 to July 16.

Arrivals reported in London.—Lieutenant-Colonel R. J. Marks, I.M.S., B.; Captain B. B. Paymaster, I.M.S., Bo.; Captain G. S. Malcolmson, I.M.S.; Major P. F. Chapman, I.M.S., B.; Major W. S. Willmore, I.M.S., B.; Major W. G. Richards, I.M.S.. M.; Captain D. A. R. Berkeley Hill, I.M.S.; Lieutenant-Colonel H. B. Melville, I.M.S., B.; Captain F. A. F. Barnardo, I.M.S., B.; Captain J. W. Barnett, I.M.S.; Lieutenant-Colonel F. P. Maynard, I.M.S., B.; Colonel D. St. J. D. Grant, I.M.S., P.M.O., Derajat and Bannu Bdes.; Lieutenant-Colonel W. R. Clark, I.M.S.

Extensions of Leave.—Captain J. C. S. Oxley, I.M.S., B., 6 w.; Major A. M. Fleming, I.M.S., B., 4 m. 28 d.; Captain W. H. Riddell, I.M.S., 4 m.; Major G. Y. C. Hunter, I.M.S., B., 3 m. 26 d.; Lieutenant-Colonel T. E. Dyson, I.M.S., Bo., 11 d.

Permitted to Return.—Captain D. A. R. Berkeley Hill, I.M.S.

LIST OF INDIAN CIVIL OFFICERS ON LEAVE (INCLUDING MILITARY OFFICERS UNDER CIVIL RULES).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Barnardo, Captain F. A. F., I.M.S.
Betts, Captain A. J. V., I.M.S., Bo., 18 m., May 4, 1912.
Chapman, Major P. F., I.M.S., C.P., 18 m., April 2, 1912
Christophers, Major S. R., I.M.S., 15 m., May 1, 1912.
Fearnside, Lieutenant-Colonel C. F., I.M.S., 6 m., March 10, 1912.
Lane, Lieutenant-Colonel D. T., I.M.S., Punj., 6 m., May 3, 1912.
Marks, Lieutenant-Colonel R. J., I.M.S., U.P., 6 m , April 27, 1912.
Melville, Lieutenant-Colonel H. B., I.M.S., U.P., 8 m., March 4, 1912.
Morgan, Major E. J., I.M.S., U.P., 6 m., April 18, 1912.
Oxley, Captain J. C. S., I.M S., C.P., 22 m., October 29, 1910.
Paymaster, Captain B. B., I.M S., Bo., 24 m., January 2, 1912.
Richards, Major W. G., I.M.S., Madras, 4 m. 24 d., May 1, 1912.
Willmore, Major W. S., I.M.S., U.P., 21 m., 2 d., April 29, 1912.
Woolbert, Lieutenant-Colonel H. R., I.M.S., 15 m. 1 d., March 29, 1912.

LIST OF INDIAN MILITARY OFFICERS ON LEAVE.

Showing the Name, Regiment, or Department, and the Period for which the Leave was granted.

Barnett, Captain J. W., I.M.S.
Berkeley Hill, Captain O. A. R., I.M.S., 4 m., from April 29, 1912.
Browse, Major G., I.M.S., 12 m., from March 29, 1912.
Clark, Lieutenant-Colonel W. R., I.M.S.
Grant, Colonel D. St. J. D., I.M.S., to October 9, 1912.
Malcolmson, Captain G. S., I.M.S.
Riddell, Captain W. H., I.M.S., 10 m., from February 19, 1912.
Twigg, Major H. J. R., I.M.S.

COLONIAL MEDICAL SERVICE.

Dr. J. E. A. Ferguson, Government Medical Officer, British Guiana, has been appointed to be the Surgeon-General's Deputy when the Surgeon-General is temporarily absent from Georgetown.

Dr. D. M. Macphail, Medical Officer, St. Lucia, has been made an official Member of the Legislative Council during the absence from the Colony of the Hon. M. A. Murphy, Colonial Engineer and Commissioner of Crown Lands, on three months leave, whose official duties are being performed by Mr. S. M. de Oca, Staff Surveyor. The Hon. M. A. Murphy being also a Member of the Executive Council, his duties in that connection have been assumed by the Hon. C. F. Condell, Inspector of Schools.

Dr. A. T. Ozzard, Government Medical Officer, British Guiana, has been granted leave until September 25 next.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the* JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.

"British Medical Journal," July 6, 1912.

Sleeping Sickness.—Balfour writes giving suggestions as regards gland puncture in sleeping sickness and also on the trapping of tsetse-flies. For performing the little operation of gland puncture he has devised a special holder, by which the gland to be punctured can be firmly held and so prevented from slipping away when the needle enters. As regards traps for tsetse flies, he describes the "Andres-Maire" process for catching moths, and thinks that this might be adapted for the destruction of the former insects as well. Another trap—a native one—consists of a spherical gourd with a hole cut in the top. It is half filled with blood, and then as soon as a number of flies have entered,

the hole is closed and the insects can easily be destroyed. It is doubtful, however, how far such traps would act under natural conditions. The trouble of watching them and keeping them in perfect order would seem to offer unsurmountable objections to their general use; but against this, however, may be adduced the success which is said to have been attained by the moth trap mentioned above.

"British Medical Journal," July 13, 1912.

The Etiology of Beri-beri.—Browning describes a case where beri-beri broke out amongst the engine room crew of a steamer, whilst the deck crew completely escaped. Both crews used the same barrel of flour, the same sack of rice, the same meat, vegetables, and water supply, and cooked in the same galley. A difference in quarters however existed, the deck crew living in the upper peak of the forecastle, which was dry, while the engine room crew inhabited the lower peak, which was often unavoidably wet. Arguing from this fact, Browning believes that dampness plays a large, if not the largest, part in the causation of the disease. Dampness may act as a predisposing factor in the production of beri-beri, just in the same way as any other lowering condition may, but it has nothing to do, of course, with the primary cause of the disease.

"The Australasian Medical Gazette," No. 386, vol. xxxi, No. 23. Sydney, June 8, 1912.

The Treatment of Hodgkin's Disease.—Harris, of Sydney, writes saying that about thirty cases diagnosed as Hodgkin's disease, have been subjected by him to the therapeutic effects of the X-rays during the past fourteen years. From this study he concludes that:—X-rays in filtered doses, properly administered, are of considerable use in cases of Hodgkin's disease. Most cases are relieved, and some have remained so for several years. In the very acute cases, with marked cachexia and asthenia, their use is naturally limited; and when employed, thorough and correct dosage must be employed, and all the enlarged areas attacked, including the spleen and liver, if they too be enlarged. The rays should be tried alone, and, failing response, then arsenic may be used at the same time.

"Indian Medical Gazette," July, 1912.

Vaccine Treatment of Leprosy.—Rost publishes a second clinical report on the treatment of leprosy by the use of a vaccine prepared from cultivations of the leprosy streptothrix. On the whole the results would seem to be satisfactory, several of the photographs showing distinct improvement. As regards the origin of the disease, Rost suggests that leprosy may be contracted through inoculation of the skin, repeatedly and at a large number of points of entrance. The conditions produced by the *Acarus scabei*, *Lichen tropicus*, ringworm or other parasitic infection give thousands of points of inoculation, and this plus an interchange of infected clothing may be sufficient. This is far more reasonable to Rost's mind than that the bed bug or other blood-sucking insect should act as the carrier.

"Indian Medical Gazette," July, 1912.

Plague in Suffolk and Manchuria.—Hossack comments on the recent outbreak of rat plague in Suffolk and the Manchurian epidemic of human plague. Hossack claims that too little stress has been laid on the fact that plague is as much a disease of man as the rat, and may spread quite easily without the agency of the latter animal. He states that in Calcutta the part played by the rat-flea can only be very small, while as regards Manchuria it was nil, a fact which lends considerable support to his views. Hossack later on in his paper states that the reason he has for so strongly and persistently combating the views of the rat-flea exclusivists is that no sound prophylaxis can be undertaken so long as measures are directed in the main against the rat and its fleas. Prophylaxis must be founded on a much broader and more common sense basis, a basis that recognizes insanitation as a leading factor in the building up of fulminating epidemics, a basis that recognizes, what this Manchurian epidemic has at last brought into the broad light of day, the importance of the human factor.

The "Australasian Medical Gazette," No. 388, June 22, 1912, vol. xxxi, No. 25.

Actinomycosis.—West, in a paper entitled "A Few Remarks on Actinomycosis, with Clinical Notes of Five Cases," remarks that it is interesting to note that four of these cases were associated with farm life, while the fifth spent his day handling wood which came from country on which stock (principally cattle) were constantly pastured. The pus, according to West, was always thin and evil-smelling and had a sour odour, or even a mousy smell. Potassium iodide had no beneficial effect on the cases in which it was exhibited, but tincture of iodine applied locally undoubtedly did good.

The "Journal of the American Medical Association," vol. lix, No. 3, July 20, 1912.

The Treatment of Tape-worm.—Allan, of Charlotte, N.C., writes recommending the use of thymol in the treatment of tape-worm disease. He believes that for the removal of *Tænia saginata*, pelletierin is too expensive for poor people, and further that it is very difficult to prepare the patients properly for aspidium. Thymol is cheap and requires no preliminary starvation or purgation, and during the past year it has seemed to him to be very effectual. He has removed *Tænia saginata* from three individuals, 11, 9, and 5 months ago, respectively, with no recurrence to date. In each instance the worms were so broken up that the head was not found, but careful observation of the stools by the patients has failed to demonstrate the passing of any segments, which, according to Braun, have had ample time to reappear.

The thymol was given in the usual way, either with or without salts the day before.

Public Health and Marine-Hospital Service of the United States—"Public Health Bulletin," No. 53, January, 1912.

Plague.—McCoy and Chapin write on plague in ground squirrels and rats in California. The susceptibility of the former rodents to the disease is a marked one, and in the majority of cases a high degree of septicæmia is developed. While studying this question the authors discovered a peculiar plague-like disease of the rodents of these parts. An organism, to which the name of the *Bacterium tularense* has been given, was isolated from these cases. The bacillus is a small one and can only be cultivated on special media. Passed into guinea pigs, the lesions, especially in the subacute or chronic types, become very like those of tuberculosis.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

THE EXAMINATION OF STOOLS FOR CYSTS OF *ENTAMŒBA TETRAGENA*.

By Dr. SAMUEL T. DARLING,
Ancon, Canal Zone.

FROM a careful study of entamœbæ obtained from clinical cases and autopsy material in this region, I am not only of the opinion that the only pathogenic entamœba of Panama is *E. tetragena*, but I am in agreement with Hartmann and Doflein that the entamœba usually described as *E. histolytica*, from cases of dysentery, is *E. tetragena*.

The only developmental (perpetuating) forms of entamœbæ in Panama cases which I have been able to detect are those of *E. tetragena*, although I have seen in imperfectly differentiated preparations that had been stained by Hasting's and Giemsa's stains, various erythrocytic and leucocytic debris which might have been mistaken for chromatin substance and misinterpreted as "spores." Hæmatoxylin-stained preparations of *E. tetragena* from infected cats also contain defunct erythrocytes which resemble "spores." I have seen in fresh preparations bizarre-looking pseudopodia suggesting the budding forms of Craig and Schaudinn; yet when these same films were stained with hæmatoxylin they revealed the characters of *E. tetragena* as well as *E. histolytica;* that is, a number of the trophozoites contained prominent karyosome rings outside the centriole, which is a diagnostic point of *E. tetragena*. I have also seen both in Giemsa and hæmatoxylin preparations unusual features in the nucleus and in the idiochromidia which might be interpreted in various ways, but these are undoubtedly degeneration forms, and they are not at all like the descriptions of *E. histolytica* by Schaudinn and Craig.

The population of Panama is very cosmopolitan and many tropical countries are represented. If *E. histolytica* really exists as a pathogenic entity, one would naturally expect it to turn up in Panama, for entamœbic dysentery is notoriously chronic, and should recur in some of the individuals who have taken up residence here from other tropical lands during the period of canal construction by the French and Americans. And we would naturally expect such individuals to have infected their environment, and we would expect to find *E. histolytica* as one of the strains of pathogenic entamœbæ in Panama. It is a fact, however, that none of the perpetuating phases of *E. histolytica* has ever been seen here.

There is usually no difficulty in detecting the sexual forms—gametes—of malarial plasmodia, in cases of malarial fever. In coccidiosis of dogs, cats, rabbits, &c., the oöcysts are always in evidence. Why, then, should *E. histolytica* be so shy of disclosing its sexual phase to the careful observer, when *E. coli* and *E. tetragena* cysts are so frequently in evidence? The most likely interpretation is that of Hartmann, who has examined Schaudinn's original preparations of *E. histolytica*, and believes that the latter described degeneration forms.

From a case of entamœbic dysentery in the service of Dr. W. E. Deeks, referred to me by Drs. James and Carter, I found trophozoites and cysts which had the characters of *E. tetragena*. That is, prominent karyosome rings and four nucleated cysts. Cysts appeared in the patient's stools some time later in large numbers; these were viable after forty-eight hours' exposure in a moist chamber, and were fed by mouth to half-grown kittens. On the twelfth day both kittens had prolapse of the rectum, following intussusception and entamœbic enteritis. This started from a superficial lesion in the mucosa of the ileum in which *many trophozoites were found which had the staining and morphological characters not only of "E. tetragena," but of "E. histolytica" and "E. nipponensis."* These variations in the morphology of the nucleus depend on variable amounts of chromatin and variations in the distribution of the same within the nuclear membrane. They appear to refer to normal and pathological (?) distributions of chromatin within the nucleus and not to different species, for they may sometimes be found side by side in material from an individual case infected by means of tetragena cysts, as in the experiment just described.

The first case recognized in Panama as *E. tetragena* I identified in September, 1911. Since then I have detected cysts, or cysts with the "small generation," in four other cases, and from a study of these cases, with an improved technique, controlled by animal feedings, I have learned that most of us have been overlooking the small generation and the cysts of *E. tetragena*, the latter having been mistaken for monad cysts or other bodies. Clinical laboratory workers in the Tropics use almost exclusively the polychrome methylene-blue eosin stains in their malarial work, and they have attempted, unfortunately, to use exclusively these stains for entamœbæ. But when used for the latter purpose, unless very carefully differentiated, they yield pictures which are easily misinterpreted. I have already called attention to this in a paper read before the Canal Zone Medical Association, February 14, 1912, a portion of which may be quoted here. "There is a very essential difference in the pictures obtained by staining with hæmatoxylin and Romanowsky stains. Hæmatoxylin stains the refractile granules and other portions of the nucleus which have been called chromatin. Chromatin is condensed in the centriole, karyosome, and under the nuclear membrane. In Romanowsky preparations it seems to have been customary to call certain structures within the nucleus and staining a bright red or purple colour 'chromatin.' But by carefully differentiating Romanowsky preparations with ammoniated ethyl alcohol it will be seen that the red or purple substance has an entirely different distribution from that of true chromatin. It will be seen that the parts of the nucleus which stain well with hæmatoxylin have taken a blue coloration in the Romanowsky preparations, and that the sub-

stance or structure between the centriole and the nuclear membrane, known as the karyosome, is frequently stained intensely purple. In other Romanowsky preparations the purple substance, or oxychromatin, is not condensed in the form of a ring, but is distributed throughout the nucleus in the form of a delicate reticulum or as fine granules, so that the oxychromatin or purple staining substance may not be identical at all times with the karyosome, but represents an acidophilic substance which undergoes certain phases within the nucleus which have hitherto been overlooked on account of the use of a crude technique not calculated to bring out the finer changes within the nucleus. This point should not be lost sight of, for it has frequently been the occasion of introducing errors into the illustrations and descriptions of entamœbæ and other protozoa in literature. For example, Dr. Craig's coloured drawings of *E. histolytica* have been reproduced by Professor Calkins in his book in black-and-white values, thus giving an erroneous impression of the structure of the nucleus, assuming, of course, that Dr. Craig's coloured drawings correctly represent oxychromatin. When we consider that hæmatoxylin preparations in black and white are the universal language, so to speak, used by parasitologists, then, with regard to the points mentioned above, the importance of always explaining whether by chromatin is meant true chromatin (basichromatin), or purple chromatin (oxychromatin), is evident."

Writers apparently unaware of this essential difference in the pictures resulting from the use of the two different stains have illustrated their papers in such a way as to make their work of very little value to some of those for whom the work was intended. Personally, I have had great difficulty in interpreting the figures and the descriptions of some of the writers on the subject of entamœbæ who have used imperfectly differentiated Romanowsky preparations. On the other hand, the best descriptions have come from those who have exclusively described preparations from wet-fixed hæmatoxylin-stained films.

Those who wish to determine the specific identity of the pathogenic entamœbæ should, in addition to a study of the trophozoite, such as is found in cases of dysentery, colitis, or liver abscess, carefully search for cysts and the small generation of *E. tetragena*. The stools of convalescent and recovered cases should also be carefully searched for cysts. In fresh preparations they are found in variable numbers, appearing in formed or fluid stools as round refractile homogenous cysts about fifteen microns (0.015 mm.) in diameter. They may be differentiated from monad cysts by the fact that the latter are smaller or larger in size, and have a heaped up crescentic border. The tetragena cysts if kept in a moist chamber, or in vaselined cover-slip preparations, will after a day or two show one, two, or four nuclei if they were homogeneous and undifferentiated at first, although frequently one, two, and four nucleated cysts with or without oblong blocks of refractile chromidia may be seen in the fresh stool.

Persons whose stools contain many cysts are infective, while those whose stools contain nothing but large trophozoites are most certainly not infective. In a number of feeding experiments with monkeys, dogs, and cats, I have been unable to infect any of those animals by feeding with stools containing the asexual generation of trophozoites, while half-grown cats may be infected with ease by feeding stools richly infected with tetragena cysts.

The cysts, therefore, being the agents whereby infection is carried from one person or animal to another person, the importance of detecting them in convalescent and recovered cases of entamœbic dysentery is evident.

The likelihood of finding cysts in any given case depends on several circumstances. In progressively fatal cases in man and animals in which the individual succumbs to infection, there may at times be seen in addition to the large trophozoites some small forms containing idiochromidia, but I have never detected cysts in these cases.

In early acute cases, in first infections for example, where the lesions were presumably superficial and where active medications by mouth had been administered, I failed to find developmental forms. But I have found them in one ambulatory case treated by means of rectal injections, in which the medicament probably failed to reach the cæcum where the lesions of entamœbic dysentery most commonly occur.

Cysts were found in one case of relapse, and in one case that had evidences of chronic colitis, and in two cases without recent histories of dysentery. One of these cases was a native child in the hospital with diarrhœa. At the same time another member of the patient's family (with whom he lived, presumably in the usual close contact of natives) was in the hospital with entamœbic dysentery. The suggestion naturally arises that the second individual had become infected from the child.

The finding of tetragena cysts in two cases not showing acute symptoms of dysentery may be explained by assuming that the lesion was in the cæcum. For I have confirmed the fact, generally well known, from a large series of autopsies, in which entamœbic colitis complicated some fatal intercurrent disease, that the commonest location of the ulcer in entamœbic lesions is the cæcum. And the symptoms in these cases are not those of dysentery, but of localized or ill-defined abdominal pain with some diarrhœa.

In addition to the importance of knowing the identity of the pathogenic entamœba in a given case, the identification should be made for other reasons. Nothing is known in a confirmatory way of the viability of and life history of *E. histolytica* in the outside world. While from experiments under way I have determined that heavily infected stools containing cysts of *E. tetragena* are infectious for forty-eight hours, and probably longer, though from studies on the fate of cysts in moist-chamber preparations, I find that there is a progressive

diminution in the number of cysts by nuclear division and issue of small amœbulæ from the cysts. In that way by the sixth day the cysts have become reduced to 1 per cent. or less of the number present during the first twenty-four hours in the moist chamber. The number on the sixth day is probably too small to infect an individual by the contamination of his food in the ordinary way. I have found, too, that when lightly infected stools were kept in the moist chamber for three days they failed to infect half-grown kittens. It is reasonable to suppose that infection, assuming man and half-grown kittens are equally susceptible, may arise by the ingestion of very small quantities of heavily infected fæces during the first day or two following the passage of the stool.

In moist chambers the cysts do not live a vegetative existence, but undergo nuclear division, division of the cytoplasm and rupture of the cyst, the young amœbulæ soon perishing in the fœcal mass.

We should remember that Schaudinn described *E. histolytica* from a few cases of dysentery, and that most of his preparations, according to Hartmann, are *E. tetragena*. And we should, in view of the work of Viereck, Hartmann, Werner, and Whitmore on the wide distribution of *E. tetragena*, examine all cases of entamœbic dysentery among convalescent and recovered patients, and satisfy ourselves of the presence or absence of tetragena cysts.

THE TREATMENT OF LEPROSY BY NASTIN.

By K. S. Wise, M.B., B.Sc., D.P.H.,
AND
E. P. Minett, M.D., D.P.H.,
Government Bacteriological Department, Georgetown, British Guiana.

The first introduction of nastin in British Guiana took place in May, 1908, when Dr. Irving, the Medical Superintendent of the Leper Asylum, imported a small quantity. His interest had been aroused, and with the small supply which he was able to secure he treated six patients. These persons were injected with this drug for three months and then allowed to go without treatment for a further three months; as no radical change or marked improvement had occurred during this six months the treatment was abandoned.

In December, 1908, however, by special arrangements, Professor Deycke, the originator and discoverer of nastin, arrived in British Guiana to test the efficacy of the treatment on a larger scale and under his personal supervision. His trial was carried out at the Mahaica Leper Asylum, situated at the mouth of the Mahaica Creek, on flat alluvial clay soil some twenty-two miles from Georgetown, the capital city. The asylum contains about 400 lepers, of whom about 275 are males and 125 females. The inmates of this asylum are housed on the cottage system, six to eight in the smaller cottages, fifteen to twenty in the larger. Professor Deycke remained in British Guiana initiating and controlling the nastin treatment until May, 1909. From this date the treatment was actively and carefully carried on by Dr. Irving, the Medical Superintendent, and Dr. Wise, the Government Bacteriologist, exactly on the lines laid down by the Professor before his departure. This continued until July, 1910, when Dr. Irving was replaced by Dr. Nedd, who continued the administration of nastin with various modifications until September, 1911, when Dr. Wills became the Medical Superintendent. From November, 1910, to August, 1911, Dr. Minett, the Assistant Government Bacteriologist, was associated with Dr. Nedd in controlling the administration of the treatment and in observing the changes of the patients. From September, 1911, Dr. Wills continued the nastin treatment in conjunction with other drugs, such as salol, chaulmoogra oil, &c., until March, 1912, since when nastin has been finally abandoned as a treatment of leprosy.

During this period six practitioners in the colony have also utilized the nastin treatment. It will thus be seen that we have had nearly four years' experience of nastin on leprosy, and that eleven medical men have taken part in its administration. The number of patients suffering from leprosy who have been brought under the control of nastin during that period is 244. The object of this paper is, therefore, to communicate the results of four years' treatment of 244 cases by eleven medical practitioners.

Before referring in detail to these cases and the results in general obtained it will be well to consider and bear in mind the recent statement of results made by Professor Deycke to the Society of Tropical Medicine and Hygiene (March, 1912). In his table (reproduced below) the cases of British Guiana are expressly excluded, as are also cases treated by the Professor personally.

Table 1.

Total number of cases treated by Nastin	Cured	Nearly cured	Considerably improved	Improved	Not improved or worse	Dead
529	13	34	131	154	192	5
	332 = 62.76 %				197 = 37.24 %	

Table 2.

Among 424 cases treated there were			Cured	Nearly cured	Considerably improved	Improved	Not improved or worse	Dead
Tub.	Anæsth.	Mixed						
219	—	—	5	8	62	64	76	4
				139 = 63.47 %			80 = 36.53%	
—	132	—	5	14	34	35	44	0
				88 = 66.67 %			44 = 33.33%	
—	—	73	1	7	24	14	26	1
				46 = 63.01 %			27 = 36.99%	

In administering this treatment the technique adopted was that introduced by Professor Deycke. One cubic centimetre was the standard dose of the nastin obtained direct from Kalle and Co., Biebrich. An all-glass syringe was used and water sedulously avoided, ether was always the fluid used for washing

and cleansing its parts. Injection was made subcutaneously in the forearm. The customary method of commencing first with the B_0 or B_1 strength and after a few weeks progressing to the B_2 strength was abandoned at Professor Deycke's direction, and all cases were injected from the beginning with B_2. In every case after two to three months a remission of the injection was practised so as to admit a quiescent interval without injection. In some cases patients had four or five two-month injection courses each year for three and a half years. During these courses 1 c.c. was injected once a week. Two years after the introduction of nastin treatment (*i.e.*, September, 1910) twenty-four of the cases who had shown no change as the effect of treatment by nastin, and seventy-one new patients were given injections of 1 c.c. of benzoyl chloride in place of 1 c.c. of nastin.

In five cases the injections of nastin were made direct into the leprous infiltrations in various parts of the body. In eight cases ½ c.c. of nastin was injected twice weekly under the skin of the forearm. In four cases 2 c.c. of nastin were injected subcutaneously every week. In the majority of patients for the last two years the nasal cavities were sprayed with a mixture of 2½ per cent. benzoyl chloride in oleum petrolatum and the ulcers treated with a solution of 5 per cent. benzoyl chloride.

It must particularly be understood that no selection of patients was adopted; as they came forward and desired the treatment, so they were injected.

Anæsthetic, tubercular cases, recent early cases, or those with advanced mutilation and leonine facies were equally accepted and placed under nastin treatment. Comparatively few were in a condition which could be regarded as an early case, whereas many had large deposits all over the face and limbs, also a massive sheet across the chest and abdomen of leprotic infiltration *en cuirasse*. In the later years the severer cases which showed no changes and which one recognized as hopeless were gradually dropped out so that in the later period there were few cases under treatment in which the length of disease exceeded ten years. The following tables show the sex, age, country of birth and race of the persons treated:—

TABLE 1.—SEX.

Male	154
Female	90

TABLE 2.—AGE.

Age	Male	Female	Total
0 to 10 years	1	1	2
11 to 20 ,,	62	34	97
21 to 40 ,,	67	38	105
Over 40 ,,	16	10	26
Fourteen unknown.	147	83	230

TABLE 3.—COUNTRY OF BIRTH.

Country	Male	Female	Total
British Guiana	102	68	170
India	30	7	37
Barbados	12	7	19
Madeira	1	1	2
Surinam	1	0	1
Africa	1	0	1
	147	83	230

TABLE 4.—RACE.

Race	Male	Female	Total
Black	84	62	146
East Indian	37	10	47
Coloured	14	3	17
Portuguese	7	6	13
White	4	2	6
Chinese	1	0	1
	147	83	230

The next table indicates the approximate length of time which the disease had existed at the beginning of treatment.

TABLE 5.

Time	Male	Female	Total
1 year and under	36	16	52
1 to 3 years	15	5	20
3 to 8 ,,	67	39	106
8 to 12 ,,	24	17	41
Over 12 ,,	5	6	11
	147	83	230

The next table shows the length of time under which the patients were under treatment.

TABLE 6.

Time	Male	Female	Total
Under 1 year	12	12	24
1 to 2 years	70	18	88
2 to 3 ,,	19	15	34
3 to 4 ,,	46	38	84
	147	83	230

Careful clinical notes of the condition of the patients under treatment were taken at regular intervals, never longer than four months. Microscopical examination was also made frequently and recorded. These examinations were directed to ascertaining in what degree the bacilli of leprosy were affected by these injections. The material was taken from the nasal mucous membrane, or by incision from nodules or anæsthetic patches. It was spread on slides and stained in various ways, more especially Zeihl Neelsen's and Gram's methods. Sections were also made of the various affected tissues, but the bacilli were not so readily observed as in the smear specimens. The increase or decrease of quantity of bacteriolysis was estimated, as far as possible, under identical conditions. The observations were made always by one of us (K. S. Wise or E. P. Minett). The estimation of bacteriolysis is, however, of doubtful value as an index of the progress of the disease. As is well known, it occurs freely in lepers who have never been under treatment at all. The quantity of bacteriolysis is not the same as in all nodules at the same moment; in fact, the results obtained from different parts of the same person at the same time are frequently bewildering. Apparently the damaged appearance of the bacilli is merely the effect in them of a local tissue reaction, probably a partial phagocytosis.

These observations were carried out in view of the claim of Professor Deycke that nastin caused definite changes to take place in the lepra bacilli, consisting essentially of the loss of their acid-fast property when

stained according to the Ziehl Neelsen's method. The majority of the patients declared after the first few weeks that they felt a lighter feeling all over. The Medical Superintendent found them more willing to work on the farm, on their own plot of land, or in other occupations. In fact, the results were those of a tonic effect. Such a cheerful and happy disposition in the patients is a frequent accompaniment of a new treatment, and has been noted by previous observers at Mahaica in connection with other treatments.

The so-called general reaction of nastin, which consists of a rise in temperature with the softening and ulceration of numerous leprotic deposits, has occurred in 3.5 per cent. of the patients under treatment. This softening and ulceration of the nodules may be recovered from with sometimes a fresh outcrop of nodules in some other spot, but more often nodule after nodule ulcerates until a very extensive chronic ulceration of an intractable type has established itself. The result is usually death from exhaustion or from some intercurrent disease. This general reaction can be observed in lepers who have never been injected with nastin.

The ulceration which so many tubercular lepers carry with them for a long time does not seem to be in any way favourably influenced by nastin.

The ulcers close up or increase in size irrespective of the nastin injections. The most effective method of dealing with these ulcers is to scrape them, and apply a wash of benzoyl chloride 5 per cent. in oleum petrolatum. The trophic ulcers of anæsthetic lepers are unaffected by nastin or by local application of benzoyl chloride. The anæsthetic patches and anæsthetic areas of the hands and feet sometimes improve and sometimes get worse during this treatment. In certain lepers the reduction of anæsthetic areas is remarkable, but so also in others there is a great increase in these areas. The greatest reduction undoubtedly occurs in the first nine to twelve months of treatment; in many of these lepers the area of anæsthesia increases to the same size or even greater than before. The natural daily fluctuations of these anæsthetic areas in untreated as well as treated cases is very great, and it is only by long and constant observations that definite statements can be made as to the decrease or increase of anæsthesia.

The wasting of muscles, the deep abscesses with necrosis of bone and cartilage went on unaffected by treatment.

Leprotic infiltrations of the eye and of the iris went through the usual course. Movement of the fingers was much improved during the four years in those who had fixed fingers. This was no doubt due to the massage which was employed at frequent intervals in some of the lepers.

In those lepers who had few nodules it was possible to observe the disappearance of special nodules. In one man a nodule on the lobe of the ear disappeared, and this being the only symptom of leprosy arrangements were made to liberate him from the asylum. Shortly before discharge the nodule returned just as big as ever. A second time this nodule disappeared, and on its return later was accompanied by an outcrop of other nodules on the cheek. A general review of the results of the past four years indicates that nastin has practically no influence on the nodules of leprosy. Chaulmoogra oil certainly produces more local effect than nastin. The results of injecting benzoyl chloride are no different to those from the injection of nastin. The above remarks apply equally to the effects of nastin injections on the bacilli of leprosy. It is true that a great deal of bacteriolysis takes place during these injections, but it is equally true that similar results can be shown in untreated lepers. The injection of nastin directly into the nodule of leprosy had no special beneficial effect. The nodules did not disappear any more readily or any more frequently than before. The variations of the dose of nastin to ½ c.c. twice weekly and to 2 c.c. once weekly made no difference to the progress of the disease.

In a report on the results of nastin treatment at the Mahaica Leper Asylum up to September, 1910, it was stated that four lepers had been discharged who had been under this treatment. The subsequent history of these cases has been ascertained. One left British Guiana almost immediately, one has died, one has had marked recurrence of the leprotic infiltration; the fourth case is kept under observation and shows no recurrence. It is possible that this patient may not have suffered from leprosy since the symptoms were very doubtful, and the lepra bacillus was found once only in frequent observations in the nasal mucus in August, 1909.

The improvement of the lepers on beginning this treatment seems a genuine effect of nastin. During the first three to six months there does seem to be a general mental improvement, a humanizing influence on the facies, a softening of old lesions, increased suppleness of joints, a slight decrease in the size of leprotic infiltrations, and an increase of tactile sensation.

This early slight improvement which makes it so difficult to relinquish belief in the final efficacy of nastin is elusive and brings a false hope. As the months proceed these changes retrogress, the intellect becomes duller than before, the face heavier and more leonine, the nodules harder and more extensive, the anæsthesia wider and more profound; inevitably it has to be realized that new infiltrations are appearing and the lepers gradually growing worse. The temporary early improvement has been noticed by many observers and no doubt accounts for the large percentage of improved cases in Professor Deycke's tables quoted above.

Ziemann at Duala in the Kamerun district reported favourable changes in the lepers at the end of five months. At the end of a year, however, he finds the condition stationary. No doubt by now the disease is pursuing its usual course.

To summarize the results of four years' experience of the Nastin treatment with 244 cases it may be stated that there was a slight temporary check to the disease during the first six months of treatment, but otherwise the natural course of leprosy has continued unchanged.

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THE JOURNAL OF

Tropical Medicine and Hygiene

SEPTEMBER 2, 1912.

RECENT INVESTIGATIONS ON THE ETIOLOGY OF PELLAGRA.

ALTHOUGH, so far, no further report has been published by the British Pellagra Commission, the investigation of this important disease has been continued, thanks to the interest and generosity of Mr. Henry S. Wellcome. Mr. Wellcome provided the necessary funds for Dr. Sambon, Parasitologist to the Wellcome Research Laboratories, to work for a further period of two months in Italy, and Dr. Chalmers very kindly went first to Egypt and later to Hungary, joining in the interim Dr. Sambon in his work in Italy. The object of Drs. Sambon and Chalmers' visit to Italy was to endeavour to find in other cases the protozoal organism they had discovered in 1911 in the brain and spinal cord of a young Roumanian pellagrin who died in the acute stage of the disease the moment they entered the pellagrosario of Roman. Unfortunately, owing to unavoidable delay in leaving, unfavourable meteorological conditions, and imposed restrictions it was not possible to attempt any experimental work, and the investigators had no further opportunities of making autopsies under favourable conditions. They were, however, able to add considerably to their epidemiological findings.

In all countries visited (Italy, Spain, Austria, Hungary, Roumania, France, Egypt), the true pellagra stations were found to be closely connected with more or less swiftly running streams, just as malaria is connected with stagnant waters; and in all the European centres, the disease appeared to be associated with Simuliidæ just as malaria is associated with Culicidæ.

Special attention was directed to the examination of children, and, contrary to the almost universally accepted opinion, it was found that, in true endemic centres, children are invariably affected with pellagra just as they are affected with malaria in malarious localities. Therefore, a place cannot be considered a true endemic centre of pellagra unless the disease is found in very young children who have never been out of the locality. The youngest pellagrin children met with were one, three and the other four months old when first attacked. Pellagrin children under 2 and 3 years of age are very numerous. Another important feature of pellagra stations is the fact that in families living in an actively infective centre all or the majority of members are usually affected. Pellagrins, and sometimes numerous pellagrins, are often found in places which are certainly not endemic centres of the disease. In such places the patients are adults with occasionally a few youths. The infants and very young children are never affected and, as a rule, only one or two patients are to be found in families of many. Pellagra in most places affects almost exclusively the field labourer, and generally those belonging to the poorest, migratory class. It is a disease of long duration, often exhibiting long periods of latency, and pellagrins are apt to become restless and especially prone to migration. All these things must be taken into account when studying the topographical distribution of the disease.

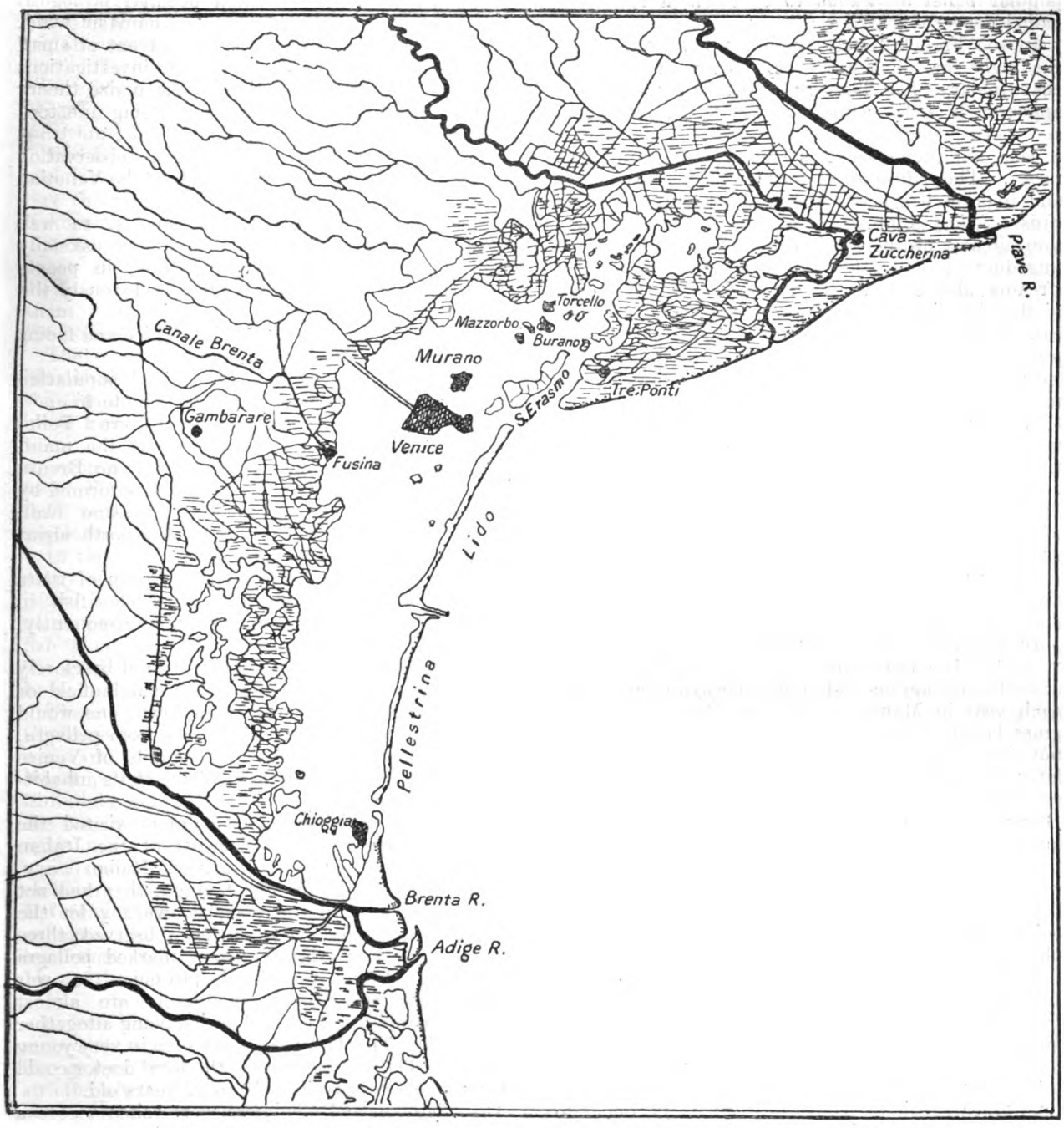
A very important fact elicited is that of the rapid infection of people who move into an endemic centre, the disease breaking out, as a rule, during the first season to which they are exposed to infection. Two years ago, Dr. Sambon gave a few examples such as that of the Pavinato children (12 to 13 years of age), all of whom contracted the disease within the same week, soon after reaching, in spring, Treponti, a pellagra centre in the Euganean Hills. This family was examined in the presence of Drs. Lavinder, Blue and Siler. Several more examples were collected since. Thus, in November, 1911, the family Bruni moved from Lerina, near Vicenza, to a place called Contrada Rebecca, in S. Pietro in Gù (Padova). At the beginning of May, 1912, all but one of its members had developed marked pellagra symptoms.

The influence of meteorological conditions on pellagra is very marked. This year, in Italy, the latter part of the winter having been exceedingly mild, pellagra broke out much earlier than usual. Later, a cold spell put an end to it at a time when, under ordinary circumstances, it would have been most prevalent.

The long and well-ascertained immunity of towns was repeatedly confirmed in all the countries visited and so also the immunity of the Jews who never engage in field work. For the same reason of occupation, gypsies were found to be immune in Hungary, but not in Roumania, where they are far more numerous and fully exposed to the infective agency.

In Oviedo (Asturias), where Casal first recognized pellagra, a very remarkable fact was elicited. Two streams, the Nora and the Nalon, run through the district. In the days of Casal, pellagra occurred

along both these streams. At the present day, the disease is limited to the banks of the Nora, not extending, according to Dr. Sarandeses, for more than two to three kilometres on either side. Both Dr. Valdes, Health Officer of Oviedo, and Dr. Sarandeses stated that cases along the Nalon are now either extremely rare or totally absent, whilst, about thirty years ago, they were still very common. They could not explain this curious, but well ascertained, fact with any of the pellagra theories known to them. Inquiries based on the insect theory soon led to the discovery that a very important change had taken place. Several industrial establishments have risen along the banks of the Nalon, polluting its waters with poisonous waste products, thus killing off all fish and other forms of life. The Nora, on the other hand, has remained in its natural condition and Dr. Sambon and Chalmers found it teeming with Simuliidæ. Together with Dr. Angel Magnet, Medico de la



Map showing the position of islands, described in the text, around Venice where Pellagra is met with.

Beneficencia Provincial, the Commissioners visited the pueblos of Lugones, Naon, Viella, and Folgueras and saw several interesting cases of pellagra. The Asturian peasants believe that the disease is acquired along the streams and that it is caused by the morning and evening moisture, a popular belief analogous to that which long prevailed concerning malaria.

In the French Landes, pellagra has become exceedingly rare, but it is very important to notice that malaria has likewise almost entirely disappeared from the same region. About fifty years ago, both pellagra and malaria were rampant, now a case of either disease is looked upon as a great rarity. The simultaneous regression of pellagra and malaria has been brought about by the same causes, *viz.*, improved drainage, intense cultivation, greater prosperity, and last, but not least, the introduction of great quantities of fish in all the streams and collections of water. In the case of the Anopheles-conveyed malarial infection one can readily understand the operation of these improvements, introduced not for the purpose of combating disease, but only for agricultural and economic reasons. Drs. Sambon and Chalmers believe that the simultaneous rise and fall of both malaria and pellagra, under identical changes in the conditions of environment, are facts which strongly suggest analogy of etiology in both diseases. In the Hure (commune of Balizac) and in other streams of the Landes, a few larvæ were found of both Anopheles and Simulium.

In the valleys of the Austrian Tyrol, the connection between stream and disease was well apparent and Simuliidæ abounded.

In Roumania the connection was likewise very evident. The Roumanian peasants say that in old cases the pellagrous rash and other symptoms recur each year in March at the time "when the new grass begins to sprout" (*O data cu coltue ierbei*), but that in new cases the symptoms appear always later, in April or May. This popular experience, confirmed by Dr. Lupu, the Health Officer of Bucarest, and other Roumanian physicians, is of interest in view of the insect theory of the disease. In malaria, the seasonal relapse, in all cases, likewise occurs at an earlier date than the incidence of the disease in new cases, the intervening period being that in which the mosquito cycle takes place.

In Bucarest, Drs. Sambon and Chalmers were told that, on the Bulgarian frontier, close to Lake Grecilor, in the village of Hotarele, inhabited by Roumanians and Bulgarians, pellagra was very prevalent amongst the maize-eating Roumanians and altogether unknown amongst the Bulgarians who do not eat maize. They proceeded at once to Hotarele and, on arrival, the local physicians, Drs. Braun and Gadescu, showed them numbers of Bulgarians exhibiting marked pellagra symptoms. The statement made with so much confidence in Bucarest was found to be absolutely unfounded in Hotarele.

In Egypt, Dr. Chalmers made a very careful investigation of the distribution and epidemiology of pellagra. He found that the disease is closely associated with water and that, as in Europe, it has two distinct periods of incidence, one from the middle of March to the end of May, the other from September to November. The incidence of the disease appears to be connected with peculiar ecological conditions, such as the rise of the Khamasin wind, the flowing of clear water and the advent of small biting flies. His observations and investigations proved decidedly unfavourable to the maize theory and pointed strongly to the disease being due to a parasitic, insect-borne infection.

The most interesting and suggestive observation made refers to pellagra in the islands of the Venetian Lagoon.

Venice, with its urban population, is, as well known, entirely free from pellagra, only occasionally some exceptional case being registered in people immigrated from the country where obviously the disease was contracted.

The island of Lido, just opposite Venice and facing the Adriatic, is likewise immune.

Murano, close by, with its industrial population of world-famed glass-blowers, is again quite free.

The islands that harbour pellagrins are: Pellestrina and Chioggia, between Lido and the mainland to the south round the mouths of the Brenta and Adige Rivers, and the group of islets formed by Burano, Torcello, Mazzorbo, St. Erasmo, &c., between Lido and the mainland to the north about the mouth of the Piave River.

Both Pellestrina and the Burano group of islets are inhabited chiefly by fishermen who fish in various parts of the Lagoon, and, not infrequently, along the mainland coast.

Burano is a small islet entirely covered by closely clustered houses. There is not a single field or garden in the whole place. As a town, one would naturally expect it to be entirely free from pellagra, just like the neighbouring town-islands of Venice and Murano, instead of which many of its inhabitants are pellagrins.

When Drs. Sambon and Chalmers visited the island, together with the delegate of the Italian Government, Major Belli, surgeon Italian navy, and the Port Physician, Dr. Jachina, they had not been ten minutes in the piazetta, waiting for the local health officer, before they observed three men and one boy exhibiting very marked pellagra symptoms. From the local physician it was elicited that the Burano pellagrins are almost exclusively males, female pellagrins being altogether exceptional. The disease is never seen in very young children. The youngest cases the local doctor could remember were boys from 10 to 12 years old.

Drs. Sambon and Chalmers were taken to see a man the local physician was about to send to the pellagrosario of Mogliano-Veneto. This man—Leopoldo Trevisan—59 years of age, was a fisherman and a native of Burano. From March to May he was in the habit of fishing along the mainland coast south of Fusina, sleeping at night in a stable at Gambarare di Mira. Whilst coasting the barene,

and especially in places near outflows of the Brenta waters and other streams, he had been frequently attacked by "mosciolini," minute flies which, he said, appeared about sunrise and more frequently in the evening towards sunset. At Burano he had seen plenty of mosquitoes, but never the "mosciolini" of the Brenta waters. At other times of the year he fished nearer to Burano, sleeping at home through the winter, in his boat in summer. His son, who had accompanied him to Gambarare, was also a pellagrin, and so were the majority of the thirty odd fishermen who worked with him.

The Burano fishermen, like all Venetian peasants and labourers, eat a great deal of polenta. They buy their maize-flour in Venice, where pellagra is unknown.

A number of Burano men are artisans; they go every day to work at the Venice arsenal. Major Belli asserted that pellagra is unknown amongst them. They invariably take with them a slice of the home-made polenta to eat at their midday meal.

The women and girls of Burano remain in the island to work at that wonderful needle-made lace, the "punto-in-aria," for which the island has been in all times famous. Pellagra is unknown amongst them. Only very few cases of pellagra are known to occur in the Burano women, and such were found to be limited to women who had been engaged in field work at either St. Eramso, Treporti, or the adjoining mainland.

In the neighbouring island of Mazzorbo there are many vegetable gardens, and the population of the island is made up partly of fishermen and partly of gardeners. The fishermen, who leave the island to fish along the mainland coast, contract pellagra; the gardeners, who remain on the island, are said to be immune.

These observations led Drs. Sambon and Chalmers to carefully examine the whole of the mainland coast embracing the Lagoon. They found pellagra prevalent all along the coast, and Simuliidæ abundant in all the rivers and many of the streams. In the coast districts the disease was again more prevalent in women than in men, and again, it was seen in infants and very young children, thus, at Cava Zuccherina, at a place called Il Cristo, they found the family Longato with four pellagrin children, and the family Berto with no less than six pellagrin children, the youngest 14 months old.

It is obvious, therefore, that the Burano fishermen contract the disease whilst fishing along the mainland coast. This explains why, contrary to the general rule, the disease in this island is restricted almost entirely to adult males and to boys above 10 years of age who begin to accompany their fathers in fishing expeditions. It explains the immunity of the Mazzorbo gardeners and of those Burano men who go to work at the Venice Arsenal. It explains the immunity of the Burano women and girls employed at lace-making. It explains the exceptional occurrence of the disease in the very few women who go to do field work on the mainland, or on the islands closest to it. It excludes any idea of direct contagion, either by contact or sexual intercourse. It excludes house infection and direct aerial conveyance. It disposes of the maize hypothesis, and it overthrows the belief in hereditary transmission—a belief which, strange to say, is held by the majority of "zëists." Indeed, it would be difficult to find a more convincing array of facts in favour of the insect-borne theory of pellagra.

In the narrow, dyke-like island of Pellestrina the conditions appear to be somewhat different. Here nearly one-third of the cases are in women and there are a few cases in children from 7 to 9 years of age who are said never to have been out of the island. There are no streams in Pellestrina any more than at Burano, and infection, if really local, can take place only by means of wind-carried insects. In the same island also malaria has been observed in children who have never been out of the island, and the local physician told Dr. Sambon, in 1911, that Anophelinæ are not indigenous, but that they suddenly appear and as suddenly disappear with certain winds.

These briefly summarized facts can only give a very imperfect idea of the long, patient, careful and conscientious work done by these two investigators, whose accuracy of observation and trustworthiness are well known. The considerable amount of material collected and the fact that the work is still in progress, will probably delay for some time a full report of the investigations. For this reason we thought it right to mention such interesting facts as those elicited at Burano, which appear to us to be the most important epidemiological facts so far brought forward with regard to the true etiology of pellagra. Thanks are due to Mr. Henry S. Wellcome for the great support he has given during the course of these investigations.

J. C.

BRITISH MEDICAL ASSOCIATION.

SECTION OF TROPICAL DISEASES, Wednesday, July 24, 1912.

Abstract of Papers and Discussions.

(*Continued from p.* 252.)

HELMINTHIC TOXINS.

DR. M. WEINBERG (Paris) contributed a paper on July 24th, entitled "Helminthic Toxins." In dealing with this subject, the author prefaced his remarks by affirming that parasites secrete toxic substances which when absorbed by the host provoke effects of various kinds. It is definitely admitted that intestinal parasites and worms in general are capable either of inoculating microbes directly, or of favouring their penetration into the organism. We have direct proof of verminous toxins in many instances, but although in other cases the proofs are indirect, they furnish us with just as conclusive evidence. Eosinophilia

affords indirect proof of the intoxication of the organism in Helminthiasis. Achard, Pröscher and Weinberg and others have shown that this eosinophilia is due exclusively to the action of parasitic substances in the hæmatopoietic viscera and explained why this eosinophilia diminishes and even disappears completely under the influence of a very intense infection or even in the course of an infectious complication. Extracts of ankylostomes have been shown to be capable of destroying red blood-corpuscles; and all parasites which live in red corpuscles elaborate hæmotoxic substances which prevent the coagulation of blood and dissolve red corpuscles. Weinberg believes that ankylostoma and sclerostoma secrete an epithelio-toxin, that is, a substance capable of dissolving epithelial cells. Sclerostoma undoubtedly secrete a cytolytic toxin for epithelial cells. In order to show that the worms secrete a true toxic substance, it is necessary to work not with an extract but with a pure parasitic liquid and to show that it is harmful to animals belonging to the same species as those infected by the worms.

Weinberg and Julian have been able to carry out their experiments on the ascarides of the horse. The instillation of some drops of ascaris liquid into the eye of a horse has caused intense congestion of the eye, swelling of the eyelids and not infrequently the horse gets dyspnœa, sweating, and at times diarrhœa. The ascaridian liquid is toxic also to other animals, guinea pigs, rabbits, &c. The liquid is not hæmolytic as several authors affirm. It produces erythrophagia, however. Thus the ascaridian toxin acts directly on bone marrow, provoking eosinophilia, but it also acts on the hæmatopoietic centres, such as the spleen and lymphatic glands. Horses can be rendered immune to this ascaridian toxin. The best proof that these parasites secrete toxins is that the organism absorbs these toxins and elaborates antibodies. The serum diagnosis of echinococcus confirms this. From his researches Weinberg considers that helminthiasis is characterized by an intoxication produced by the toxic products the parasites secrete; the parasites produce also mechanical lesions of the intestine and other organs, and they, no doubt, also convey microbes which cause infective diseases which in turn may prove more serious than the mere presence of the worms themselves in the intestines.

Dr. F. LAW (British Guiana) drew attention to the fact that some intestinal worms that are not blood-suckers cause an intense anæmia, which disappears with the expulsion of the worm, showing the probability of the presence of a toxin, the manufacture of which disappears with the expulsion of the worm. A further evidence of toxic action is to be found in the pyrexia so common in Ankylostomiasis. The febrile state is not due to intercurrent disease, but in all probability directly to the toxin the intestinal worm produces.

Friday, July 26.

TROPICAL AGRICULTURAL SANITATION.

(I) Dr. MALCOLM WATSON (Federated Malay States) contributed a paper on "Tropical Agricultural Sanitation." Dr. Watson prefaced his remarks by stating that in the Tropics the medical officer was frequently called upon to deal with the sanitation of a newly opened district where every item has to be instituted *de novo*, and where expenditure has to be closely considered. The medical officer again is frequently compelled to act hurriedly when an epidemic is present and labourers on estates are perishing in numbers. Of the many qualities required of a medical officer dealing with sanitary problems in the Tropics, tact, experience, coolness, and deliberation of judgment, and a careful eye to economy, are some of the most conspicuous. In dealing with malaria in low-lying countries, removal of jungle and a thorough system of open-air cultural drainage is necessary. In high lands where a different mosquito obtains to that which carries malaria in the low country, and which breeds in clear, running streams, the method adopted has been where possible to put the water in ravines underground.

Cholera is a frequent scourge amongst imported coolies. Dr. Watson isolates new arrivals for a week before going to work amongst those already on the estate. When an outbreak occurs in coolie quarters the huts are evacuated and the population accommodated in little huts adjacent, each hut containing three people, thus forming a "contact" camp. Should a case occur in a hut in a contact camp the patient is taken to the cholera camp and the infected hut burned down, the remaining two inhabitants of the hut are washed in a disinfectant and given clean clothing; the old clothing and all possessions from infected hut are then burned. The prevention of cholera consists in a pure water supply; and this will require in most places that the water be brought from the hills and not obtained from shallow wells locally. When the hills are too far off to get water from it is better to get water from the nearest river and filter it by a Jewell or Candy filter. Diarrhœa and dysentery are, in Dr. Watson's opinion, due, not to water pollution, but to impure food.

In housing coolies the site is all important. Tuberculosis is becoming more rife in tropical countries where coolies are being housed in brick houses instead of in huts as heretofore.

Although ankylostomiasis is a scourge its effects are apt to be exaggerated, and other diseases, especially malaria, are apt to be mistaken for it. The compulsory use of latrines by the coolies is difficult for several reasons, prominent amongst which is caste prejudice.

(II) W. CARNEGIE BROWN (London) pointed out the importance of the medical officer bearing in mind the financial aspects of any scheme he may bring forward. Dr. Carnegie Brown considers the essential conditions of success in dealing with estate sanitation to be:—

(1) The provision of a good water supply.
(2) Permanent anti-malarial precautions.
(3) A suitable dietary.
(4) Sterilization or destruction of sewage.
(5) General cleanliness and careful scavenging.

From practically whatever source water is obtained

in the Tropics, it ought to be boiled for drinking purposes, and after boiling it should as far as possible be kept sterile. The Lawrence apparatus is a ready and economical method of sterilizing water.

Antimalarial measures ought to be carried out by a special staff of men in coolie camps; swamps near by should be drained, pools covered with petroleum, broken bottles and tins capable of holding water removed from the environment of the camp, and water barrels, &c., screened; mosquitoes should be driven from houses or killed by fumigation. Quinine as a prophylactic measure should be given, and in malarial districts the children at schools should be given quinine systematically, and mosquito nets for Europeans are imperative. The disposal of sewage in the prevention of ankylostomiasis is of prime importance; if the soil is infected by the parasite, the feet should be protected either by boots, or by covering the sole of the foot by tar and sand. All camp sewage ought to be incinerated. Diet as a means of preventing the spread of beri-beri is fairly well understood now-a-days.

(III) Dr. W. F. LAW (late British Guiana), in discussing sanitation on agricultural estates in the Tropics, drew attention to the necessity of permanent ventilation and of keeping the structure of the dwelling dry. The ventilation is best accomplished by making a gap on one side of the roof, known locally as the "cow mouth" and leaving an interval between the sides of the abode and the roof termed the "eave" space. The ground around the dwelling should be drained by a small open trench, running midway between two lines of huts in the camp. The trenches are graded so as to fall into the main drainage trench which runs at right angles to the small trenches along the outer side of the encampment. Dr. Law advises for British Guiana that the storage of rain water should be in concrete tanks. These tanks have to be systematically cleared out. Drs. Law and Wise believed they traced an outbreak of dysentery to contamination of the drinking water by carrion crows. Latrines are essential adjuncts to every encampment, and it is not true that the East African coolie in British Guiana will not use them. Dr. Law advocated and carried out a plan for latrines whereby the fæcal matter was deposited in the water of the trenches and carried out to sea. In inland districts the bucket system would seem to answer best. As regards mosquito destruction the usual steps of screening barrels and emptying yards serve their purpose no doubt, but when rice cultivation is followed it is impossible to get rid of mosquitoes, unless the rice field is some distance away from the dwellings. Quinine prophylaxis is efficacious and with a little patience and tact it is possible to get the coolie to take quinine for this purpose.

(IV) Drs. K. S. WISE and E. P. MINETT (British Guiana) dealt with the sanitation of agricultural estates under several headings: (1) *Disposal of Fæces.* The configuration of British Guiana being absolutely flat, being below high tide level for the most part, and the soil being of stiff clay, almost impervious to water, the disposal of fæces is a difficult problem. The authors state that they are experimenting with various schemes for disposal of sewage based on the principle of a grit chamber leading to an enclosed septic tank, so arranged that the overflow from this is conducted down an open gutter filled with coke or clinker, to act as a nitrifying bed. It is hoped by this means to provide a satisfactory effluent which can be run into the main draining trench and not be offensive.

(2) *Drinking-water Supplies.*—The usual sources of supply are: Rain water from roofs; impounded peaty savannahs and river water brought by open canals; and well waters from various depths. Water derived from artesian wells at various depths in British Guiana is too hard and too brackish for general use. Rain from roofs, if left unprotected, is apt to become contaminated. Drs. Wise and Minett recommend that stored rain water should be rendered safe by the addition of one ounce of fresh chlorinated lime per 1,000 gallons occasionally—say, monthly in the wet seasons, every three months in the dry season. The plan in vogue in many estates of taking water from long trenches alongside the coolie ranges has very grave objections.

(3) *Housing.*—The coolie ranges in British Guiana are built of wood and kept in good order; the existing building regulations for the coolie quarters are laid down by Government and have proved satisfactory. Were these dwellings raised 5 ft. from the ground a great improvement would be the result.

(V) Lieutenant-Colonel JOHN RITCHIE considered that the reduction of malaria by quinine had proved the most efficacious, and that a weekly dose of 15 gr. of quinine is sufficient. Concerning the disposal of sewage, Lieutenant-Colonel Ritchie considers that the shallow trench plan is better than the use of the incinerator.

(VI) Major CHRISTOPHERS considered 5 gr. quinine daily a better plan of prophylaxis than by giving a large dose weekly. He drew attention to the importance of the economic factor in agricultural sanitation in the Tropics. In a paper entitled "Tropical Aggregation of Labour," written by Drs. Bentley and Christophers, attention was drawn to this aspect of disease and to the severity of malarial outbreaks amongst native labour communities during the occurrence of economic stress amongst them. This is often hidden from neighbours and inquirers, but, nevertheless, it is a point which demands close investigation of the economic conditions as they affect the individual coolie.

(VII) Dr. LAW said in British Guiana he now gives daily doses of quinine; in a country difficult to drain this is the best plan of prophylaxis against malaria.

(VIII) Dr. MINETT (British Guiana) said that campaigns against mosquitoes should be regarded as the first line of defence against malaria, and quinine the second. In his practice he recommended 5 gr. three times a week instead of a large dose once a week. He considers that although quinine diminishes the results of infection as regards fever, it does not prevent the actual reinfection.

(IX) Captain C. RYLEY, R.A.M.C., stated that in Hong Kong two companies of a British regiment newly arrived in the Colony from home were encamped upon an area known to be malarial. In order to test the efficacy of quinine as a prophylactic, 5 gr. of sulphate of quinine were given daily to one of these companies. After a time blood examinations showed that forty-seven men of one company and forty nine of the other had benign tertian parasite infection.

(X) Dr. PROUT, C.M.G. (Liverpool), said that whilst schemes recommended for improvement of sanitation must be tempered with common sense as regards expenditure, still there was a danger of being too economical. He considered that the whole question of tropical sanitation required co-ordinating, and advocated the formation of a central board for all the Colonies, so that the pressing needs of particular colonies could be dealt with efficiently and speedily.

TREATMENT OF ELEPHANTIASIS.

Professor F. C. MADDEN (Egypt) and Professor A. R. FERGUSON (Egypt), contributed a paper on "Some Clinical and Experimental Observations on the Treatment of Elephantiasis of the Legs by Lymphangioplasty." The authors record a series of cases of elephantiasis in which they have put in practice Mr. Handley's plan of treating the ailment by lymphangioplasty. The technique followed consisted of: "Preparing the leg for a week before operation by painting it daily with a 2 per cent. solution of iodine in rectified spirit, after removing any specially thick skin by the application of salicylic acid and resorcin ointment. The patient was kept at rest during the time with the leg ensheathed in a mass of wool from the toes to the groin, and bandaged. The threads were introduced and passed up the inner side of the leg from the instep well on to the abdominal wall, and sometimes were introduced on the outer side as well. The result of the operation in several cases reported was unsatisfactory. So long as the patients were kept in the horizontal position the results were apparently good, but as soon as the erect position was assumed and the patient got about the swelling rapidly returned, and the leg became as swollen as before the operation. It would appear from the experiments conducted by Madden and Ferguson that, quite apart from the action of gravity, the artificial lymph-channels do not persist for any length of time, and that there is finally an obstruction to lymph return from the obliteration of lymphatics in the neighbourhood of the inserted thread. In order to ascertain the "condition of thread and surrounding tissues after lymphangioplasty in a healthy patient," the operation of lymphangioplasty was performed on a patient with a healthy limb by Dr. A Ibrahim, and twenty-one days later a block of tissue containing a portion of the thread and the surrounding tissues was cut out and examined. The experiment showed from the dense tissue and apparently progressive nature of the reaction which had taken place round the introduced thread, that it does not appear probable that anything of the nature of a lymphatic channel sufficient to maintain a permanent drainage of lymph from the surrounding tissues into the canal and round the thread could occur. The investigation was tried also after lymphangioplasty for elephantiasis, when it was seen that the thread, apparently unaltered, slid readily up and down in a thick-walled canal of fibrous tissue, and that the formation of this material made it appear highly probable that the channel would, when the thread was removed, be obliterated by pressure. These experiments were repeated in healthy guinea-pigs. The authors conclude: (1) That lymphangioplasty fails to effect anything but a very temporary improvement in elephantiasis of the legs; (2) in addition to the action of gravity, it appears that want of success is due in a far greater degree to changes in the tissues which soon isolate the tube created by the thread, and eventually completely obliterate it.

Annotation.

Sleeping Sickness in Northern Rhodesia.—In a report on sleeping sickness in Northern Rhodesia* Dr. May, the Principal Medical Officer, gives the results of the work accomplished up to the end of February, 1912. He states as a summary of the work of the Luangwa Valley Sleeping Sickness Commission, the following:—

(1) The human trypanosome in the Luangwa Valley is transmitted by *Glossina morsitans* (Westw.).

(2) Approximately 5 per cent. (4.76) of the flies may become permanently infected and capable of transmitting the virus.

(3) The period which elapses between the infecting feed of the flies and the date on which they become infective is approximately fourteen days.

(4) An infected fly retains the power of transmitting the disease during its life, and is infective at each meal.

(5) Mechanical transmission does not occur if a period of twenty-four hours has elapsed since the infecting meal.

(6) Some evidence exists to show that in the interval between the *infecting* feed and the date on which transmission becomes possible the parasites found in the flies are non-infective.

(7) *G. morsitans* in nature has been found to transmit the human trypanosome.

(8) Certain species of buck, viz., waterbuck, hartebeeste, mpala and warthog have been found to be infected with the human trypanosome.

(9) A native dog has been found to be infected with the human trypanosome.

This summary shows, as Dr. May says, that the object which determined the formation of the Commission has been accomplished, and *G. morsitans*

* The British South Africa Company: Administration of Northern Rhodesia. Report on Sleeping Sickness in Northern Rhodesia to February, 1912, by A. May, M.D., Principal Medical Officer, Northern Rhodesia. Livingstone: Printed at the *Administration Press*, Northern Rhodesia, 1912.

has been incriminated as the transmitter of the disease both in nature and under laboratory conditions. In addition to this it has been found that certain animals can act as the hosts of this virus without suffering thereby, and that the trypanosome has a wide distribution in nature.

As first constituted the Commission consisted of Dr. Allan Kinghorn, of the Liverpool School of Tropical Medicine and the West African Medical Staff, as Chief Investigator (Dr. Kinghorn had previously, with Mr. Montgomery in 1907—1908, under the auspices of the Liverpool School, been in charge of similar investigations on Lake Tanganyika and elsewhere in Northern Rhodesia), Dr. H. Leach of the Northern Rhodesia Medical Service, as Entomologist, and a Bacteriologist.

Shortly after Dr. Kinghorn's arrival in the Luangwa Valley, Dr. Leach was granted sick leave. He was replaced by Dr. A. F. Wallace of this service. Mr. Ll. Lloyd, formerly Curator of the Sheffield University Museum, replaced Mr. O. C. Silverlock, who was drowned while examining the Zambesi for *G. palpalis*, and later Dr. Warrington Yorke, of the Runcorn Research Laboratories, joined the Commission.

Nawalia, on the Nyamadzi River, a tributary of the Luangwa, was selected as the site for the headquarters of the Commission. This station being on the Mpika—Fort Jameson Road about 40 miles to the east of the Muchinga Escarpment, and about 14 from the Luangwa River, E. 32.2 12.4 S. The altitude of the laboratory site was roughly 2,100 ft.

As regards the prophylaxis of the disease Dr. May discusses the question of the destruction of the game. He say that:—

"In connection with Sleeping Sickness prophylaxis, game has to be regarded from two practically independent points of view, namely (1) as offering a means of subsistence to the fly; (2) as reservoirs of the disease.

"The bulk of the opinion in this country seems to favour the view that the larger antelope are responsible for the presence of tsetse fly, and that their destruction would be quickly followed by the disappearance of fly. These views lack proof. There is undoubtedly a certain amount of circumstantial evidence in favour of the former, but it is, I think, mainly based on limited local knowledge; personal observation has convinced me that either view can be almost proved by the proper selection of local conditions. That the destruction of game would be followed by the disappearance of the fly is purely conjecture and is based for the most part on what is reported to have followed the rinderpest. Recently, however, the discovery that certain varieties of antelope harbour a trypanosome morphologically and in many of its animal reactions identical with the Luangwa variety of human trypanosome, and which is transmissible by *G. morsitans*, forms in conjunction with such evidence as there is in favour of the relationships between this fly and antelope, a very strong case against the latter; and should this trypanosome eventually be proved beyond a doubt to be pathogenic to human beings, and failing the removal of the fly by other means, the question of the removal of the antelope as reservoirs of disease will have to be considered.

"It does not seem clear how those who urge the destruction of the antelope propose that it should be done.

"Arming the natives, the encouragement of game drives on a large scale, trapping, and other such methods have been suggested.

"There seems little doubt that a limited area can by means of the methods enumerated above be cleared, at least temporarily, of game; it must not be presumed, however, that this game has been destroyed, the greater part of it in all probability has simply migrated in search of safety. These methods deserve consideration as a means of ridding the neighbourhood of European settlements, and other habitation (limited areas), of game and possibly of fly, the result being brought about more by migration than by destruction.

"To apply it, however, to a large area, such as the Luangwa Valley, which is known to be infected, would be to drive the game elsewhere, in all probability on to the Muchinga Plateau and into Nyasaland, and into the fly-belts occurring there which we presume are not yet infected, and which by means of regulations and strict supervision, every effort is being made and considerable money expended to keep free from infection, and which efforts would be immediately defeated by this procedure.

"The time which such methods would take to provide an appreciable diminution in the amount of game must also be considered. It seems reasonable to suppose that at least ten years would elapse, even under the conditions of an organized warfare against the game, before any marked diminution in their numbers would become apparent, and that even at the end of such time it is probable that a sufficiency for the maintenance of the fly, if such be necessary, would still remain, and the fly, though possibly not so numerous, would still be in sufficient numbers to support an epidemic and produce a situation little, if anything, in advance of the original.

"A method which is so slow and so imperfect, and accompanied by so much danger and doubt as to its results, cannot be regarded as one of practical utility or as one suited to the requirements of the present situation.

"The agitations at present evidenced in many quarters for the wholesale destruction of game must be looked on as premature and as resulting from ignorance of local conditions and from an ill-conceived idea both as to its practicability and possibilities.

"The practical demonstration of what may be expected to follow such efforts will be shown by the experiment which has been approved, namely, the complete destruction of all game in the limited and definitely restricted fly-belt in the neighbourhood of Sitchitambos and Kanduza's villages, on the Southern Border Road.

"This will be carried out during the coming dry season, and accurate observations as to its results

will be made until some definite opinion can be given as to its effect."

As regards the prophylaxis of the Luangwa closed area, Dr. May states that under the conditions which now obtain, namely, transmission by *G. morsitans*, complete prevention would consist of the adoption of one of the three following methods: (1) Destruction of the fly; (2) removal of all sources of infection, namely, infected human beings and mammals; (3) removal of the population.

(1) *The Destruction of the Fly.*—"The destruction of the fly is obviously the root of all prophylaxis, and if possible the end to be attained. Its complete destruction means the elimination of the disease, as well as inestimable advantages apart from questions of health. Unfortunately, there are no means at present known by which this can be attempted with any hope of success. The question of the influence of game destruction in this connection has been discussed elsewhere. This also is a subject on which no definite knowledge is available; such measures as we have knowledge of are merely palliative and applicable only to a very limited extent. Little is known of the binomics of this fly in nature, and a study of its natural enemies, essential food, and breeding habits, in addition to what disease if any it is liable, will form a useful ground work for investigation. It cannot, perhaps, be confidently asserted that a complete knowledge of this subject will necessarily include the knowledge of a ready means of elimination. It is, however, probable, that an increase in the knowledge of its life and propagation will help to do so, and the proposal has now been approved that as soon as the details can be arranged a staff of trained entomologists will start to work out this most important problem."

(2) *Removal of Infected Human Beings, i.e., Segregation.*—"The question of segregation in the Luangwa closed area will have to be regarded from an entirely different point of view to elsewhere in sleeping sickness administration. In dealing with human trypanosomiasis transmitted through the agency of *Glossina palpalis*, it is a matter of comparative ease owing to the habits and restricted distribution of this species to place infected persons outside all possibility of being a danger of further infection to the fly and a source of danger to others. It is, however, very different in dealing with *G. morsitans* as the transmitting agent, and the question of the desirability for the removal of infected persons in these areas, both with a view to segregation and also to treatment, has to be reconsidered. One, if not the chief benefit to be expected from segregation is the limitation of the source of infection. It has to be considered whether this can be expected to follow segregation under the conditions with which we are dealing. A native suffering from trypanosomiasis is moved from his village to the segregation camp, which in the great majority of cases is at a considerable distance, probably several days' journey and mainly through fly belts, thus constituting a danger towards the spread of infection. A trypanosome, identical in many respects with the human trypanosome, has been found by Dr. Kinghorn to be harboured by several varieties of antelope; to remove a human being suffering from trypanosomiasis, with the idea of limiting the sources of infection and at the same time to leave many other sources behind, does not seem to justify the dangers and difficulties involved in so doing. The effect of the system of segregation on the native mind is a most important factor and one having a very great influence on its possibilities. The system is at present regarded with extreme distrust and fear; this is not unnatural as up to the present nearly all the cases so removed have terminated fatally. Consequently there is a tendency on the part of the natives to evade this treatment, and there are signs that it will become increasingly more difficult to discover cases of the disease if the result of doing so is to be segregation. Treatment has so far given no encouraging result; it cannot therefore be urged that the condition of the individual will be bettered by removal, nor since by his removal the source of infection is not removed, will the condition of the community be appreciably improved. The possibility of removal while trypanosomes are temporarily absent from the peripheral circulation as the result of treatment must be considered. This, if practical, would obviate the danger of the spread of infection from the patient en route, but would not in any way meet the difficulties arising from the natives' fear and distrust of segregation and would require for its effective working such a great increase in staff and expenditure that its possible advantages are more than counterbalanced by its known disadvantages. Since therefore segregation is neither an advantage to the individual or the community, but rather a source of danger, it is recommended that for the present except in the neighbourhood of stations and in connection with the amalgamation and removal of villages, where it is practicable and effective, it be discontinued to be regarded as an essential in prophylaxis."

(3) *Removal of the Population.*—"To depopulate the Luangwa closed area, containing probably 120,000 people, Dr. May thinks may be taken as an impossibility; the natural difficulties are enormous, the population would immediately become antagonistic, the staff required for the work would be immense, and an increased mortality from the disease, and several years' famine would be the almost inevitable results. The method which he therefore suggests is a modification of (2) and (3), and roughly consists of the amalgamation and removal of the more conveniently placed villages to a suitable fly-free area, where centralization could be effected in the treatment of disease and also in the necessary supervision required to ensure no return to dangerous areas. A movement of this sort will be to some extent limited in its applicability and must necessarily be gradual. The selection of suitable sites, the preparation of gardens and provision for food supplies will take a considerable time. In addition to this he further recommends for the whole area that: (*a*) Natives in fly areas should be prohibited from keeping domestic animals, goats, sheep, dogs, &c. (*b*) That they should be encouraged by means of trapping, pits, drives, and if possible in being allowed a certain number of firearms, to clear

the vicinity of all villages in fly country of game, and that except in the vicinity of villages game should be as far as possible unmolested in order to prevent their movement into areas free of infection. (*c*) That natives should be encouraged to protect all cultivated lands, by means of cuttings or clearings from fire, with the object of allowing a more complete clearance to be made by means of grass fires. At present in many places the native is reluctant to start a grass fire owing to the danger of losing his crops thereby. (*d*) That the headman of each village should be encouraged, by means of small payments, to rid as far as possible the immediate vicinity of his village of fly by means of mechanical appliances for trapping, &c. The details of this work might be under the supervision of the medical officer of the district. And (*e*) that certain routes, to the exclusion of all others, should be used for all natives and others travelling through these areas, and that these routes should as far as possible be rendered safe both by the removal of infected cases and by the encouragement of game destruction in their vicinity."

A perusal of these extracts from Dr. May's interesting report shows that the question of stamping out this latest form of human trypanosomiasis is to be by no means an easy one. Still something must be done, and certainly many of the suggestions put forward by Dr. May are very sensible and worthy of an extended trial.

Notes and News.

A Cruise to the Far East.—Sir Henry Lunn, 3, Upper Woburn Place, Tavistock Square, London, W.C., is planning a cruise to the Far East to start early in October.

The passengers will spend four months from Marseilles, visiting Japan, China, the Malay Peninsula, Ceylon, India, and Egypt. The total cost of the cruise, including excursions at the ports of call, is £147. Certain optional extended tours in China, Japan and India are also arranged for, the cost of which will be additional to this sum.

Notes on Books.

AIDS TO TROPICAL HYGIENE. By Major R. J. Blackham, D.P.N., R.A.M.C. London: Baillière, Tindall and Cox, 8, Henrietta Street, Covent Garden.

This little book, "Aids to Tropical Hygiene," will be found of value, especially to laymen. It is not quite correct, of course, to say that the subject of Tropical Hygiene has hitherto been much neglected. Of recent years there has been very great activity in this branch of medicine, as evidenced by the discussions at the annual meetings of the British Medical Association and also by the appearance of Professor Simpson's well-known book on the subject. Still, the layman does not have ready access to such sources of information, and to him, as has already been said, the work should prove useful. It is of moderate price, only 3s., so it should be well within the reach of all.

Personal Notes.

COLONIAL MEDICAL SERVICES.

West African Medical Staff.

No deaths.

No transfers.

Resignation.—A. J. Smith, M.B., Ch.B., Birmingham, Medical Officer, Gold Coast.

Retirement.—W.M. Woods, L.R.C.S., L.R.C.P., L.M.Ireland, D.T.M.Liverpool, Medical Officer, Southern Nigeria.

Appointments.—A. E.Horn, M.D., B.Sc.Lond., M.R.C.S.Eng., L.R.C.P.Lond., D.T.M. and H.Cantab, has been appointed Personal Assistant to the Principal Medical Officer of Southern Nigeria; T. F. G. Mayer, M.R.C.S.Eng., L.R.C.P.Lond., has been selected for temporary special service at the Colonial Office; D.J.F.O'Donoghue, L.R.C.S., L.R.C.P., D.P.H.Ireland, D.T.M.Conjoint, has been selected for appointment as a Medical Officer, Gold Coast.

Other Colonies and Proctectorates.—W. B. Cunningham, M.B., B.S.Glas., has been selected for appointment as a Supernumerary Medical Officer for the Leeward Islands; E. E. Field, M.D., Ch.B.Edin., D.P.H.Cantab, has been selected for appointment as an Assistant Medical Officer in British Guiana; R. D. Fitzgerald, M.B., B.Ch., B.A.O. Dublin, has been selected for appointment as a Medical Officer in the Straits Settlements; A. L. George, M.R.C.S.Eng., L.R.C.P.Lond., L.D.S.Eng., has been appointed a supernumerary Medical Officer in Trinidad.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"The Journal of the American Medical Association," vol. lix, No. 4, July 27, 1912.

Rodent Extermination.—Rucker advocates the necessity for rodent extermination in American seaports. His paper was read in the Section on Preventive Medicine and Public Health of the American Medical Association at the Sixty-Third Annual Session, held at Atlantic City, June, 1912, and is full of interest. He concludes his remarks by saying that "Since plague is a disease of commerce, and since plague is a disease of rats, and since rats journey over the world in ships, it is the duty of persons who are charged with the protection of the health of marine ports to kill rats in ships. This is best done by periodic fumigation, either by sulphur dioxide gas, carbon dioxide, carbon monoxide or funnel gases. This is cheaply and easily done, and if these remedies were periodically applied at all of the ports of the world it would not be very long before the disease ceased to follow the track charts of marine commerce. In order to secure such action, it would be necessary for the powers of the world to enter into an international sanitary

agreement. This would entail considerable labour and expense, but if it were accomplished it would prove a measure of great good. Couple this with the extermination of rodents in seaports, and plague would soon be relegated to the museum of paleolithic sanitation."

"The Philippine Journal of Science," vol. vii, sec. B, No. 1, February, 1912.

Schizogony of Trypanosoma evansi in the Spleen of the Vertebrate Host.—Walker deals with the question of the schizogony of *Trypanosoma evansi* in the spleen of the vertebrate host in the above number of the *Philippine Journal of Science*. His summary of his work is that such a developmental cycle of *Trypanosoma evansi* does take place. The observations of Salvin-Moore and Breinl, Fantham, and Buchanan, that forms similar to the young schizonts of *Trypanosoma evansi* occur in the internal organs of animals infected with *Trypanosoma gambiense*, *T. rhodesiense*, and *T. brucei*, make it probable that schizogony is a reproductive process common to the trypanosomata. The validity of *Schizotrypanum* (Chagas), he believes, as a genus distinct from *Trypanosoma* (Gruby) appears to be doubtful, but at the same time he is of the opinion that further investigations are necessary to determine the significance of this schizogony in the life-cycle of the trypanosomata, and its relation, if any, to latency in trypanosomiasis and to relapses after chemo therapeutic treatment.

"Journal of the Royal Army Medical Corps," No. 2, August, 1912, vol. xix.

Fevers in Calcutta.—Bradley and Smith report a curious case of fever from Calcutta. The symptoms seen in the case were pyrexia, an injected, flushed appearance of the eyes and face, an eruption of the nature of a subcuticular mottling, marked delirium, with nervous prostration. Blood-films were examined but gave no indication of malaria. Six days after the temperature fell the patient was considered to be out of danger. The authors suggest that the case may have been one of typhus, and from the description of the symptoms this seems quite possible.

"The Lancet," August 10, 1912.

Leucocyte Counts and Cirrhosis of the Liver.—Rogers states that leucocytosis is common in ordinary cirrhosis of the liver, a high degree being of an immediate and bad prognostic significance. In an analysis of 32 cases of this condition in no less than 18 a history of antecedent dysentery was obtained, while in the remainder the point was not noted, so it may have been present in many of them also. This connection he believes strongly supports the conclusions derived from an analysis of his *post-mortem* records, namely, that former chronic dysenteric ulceration is the cause of the great excess of cirrhosis of the liver in Calcutta.

"New York Medical Journal," August 3, 1912.

Pellagra.—Wood discusses the term "pellagra *sine* pellagra," by which is understood pellagra without any skin indications. This subject has attracted the attention of students of the disease from the beginning, and still remains in an unsettled state. Lombroso used to teach its existence. Wood himself believes that it is important to begin the treatment of the disease early, and for this reason alone pellagra *sine* pellagra becomes important. Were it not for this fact he considers that it would be advisable to drop any consideration of pellagra without skin manifestations.

"Transvaal Medical Journal," vol. vii, No. 12, July, 1912.

Zëism.—Nightingale believes that a disease exists in Southern Rhodesia due to eating defective mealie meal. To this condition he has applied the term "zëism." He also lately advanced the theory that scurvy, at least, in Rhodesia, was due to a fault in the maize, and suggested that an investigation carried out on certain lines would probably show that the flaw lay in the steam-milling process. The symptoms given by the author for his so-called zëism resemble those of pellagra in some ways.

"The Journal of the American Medical Association," vol. lix, No. 6, August 10, 1912.

Syphilis complicated with Uncinariasis.—Dorsett reports a case of primary syphilis treated with 0.6 grm. of salvarsan intravenously, but without improvement. It was then also discovered that the patient was suffering from ankylostomiasis, and the usual treatment for that disease brought away large numbers of worms. Immediately after this improvement began and on the fourth day the patient felt like another person, the chancre and all the other symptoms of syphilis quickly disappearing within the next ten days.

Bulletin de la Société de Pathologie Exotique, tome v, March, 1912, No. 3.

Fowl Plague.—Hindle describes attempts to transmit "Fowl pest" by *Argas persicus*. At the suggestion of Professor Marchoux the following experiments were undertaken in order to determine whether "fowl pest" (*la peste aviaire*) could be transmitted by the bite of *Argas persicus*, and also apart from this, to see whether the virus could pass through the wall of the alimentary canal and appear in the cœlomic fluid of the tick. The results showed that although *argas* is unable to transmit the disease, yet the virus remains alive in its gut for a period of about nine days. The virus, however, is not able to traverse the wall of the gut, and therefore neither the cœlomic fluid nor any other part of the tick, except the contents of the alimentary canal, become infected.

"British Medical Journal," August 24, 1912.

Granule Shedding in Trypanosoma Gambiense.—Ranken states that he has seen the so-called "infective granule" in trypanosomiasis, first demonstrated to him by Major Fry in the trypanosomiasis of animals, in *T. gambiense*, and he describes in detail the extrusion of this body from the protoplasm of the parasite. His summary of the subject is as follows:—(1) The "infective granule" of trypanosomiasis occurs in *T. gambiense* in cases of sleeping sickness. (2) Granule shedding has been observed, and the free granule seen in lymph glands and internal organs —liver, spleen, and lung. (3) The granule is at first pyriform, but develops a flagellum. It is actively motile, and can be distinguished from "blood dust."

Notices to Correspondents.

1.—**Manuscripts sent in cannot be returned.**

2.—**As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.**

3.—**To ensure accuracy in printing it is specially requested that all communications should be written clearly.**

4.—**Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.**

5.—**Correspondents should look for replies under the heading "Answers to Correspondents."**

Original Communications.

THE HOUSE-FLY AS A CARRIER OF TYPHOID INFECTION.

EXPERIMENTS MADE AT THE CENTRAL RESEARCH INSTITUTE OF INDIA.

By Lieutenant-Colonel F. WYVILLE THOMSON I.M.S.(R.), M.A., M.B., C.M., D.P.H., D.T.M., F.R.S.E.

THE opinion that the common fly is an active factor in the dissemination of bacterial disease—especially of summer diarrhœa and typhoid fever—has been growing for some years, and the importance now attached to this subject leads me to publish the results of some experiments undertaken at the Central Research Institute of India, at Kasauli, in the summer of 1907, in the course of the Enteric Fever Commission held there. The inquiry was made with a view to determining how far the house fly may be a possible carrier of typhoid infection, either by direct mechanical contamination or through a vital process following the ingestion of typhoid bacilli by the fly.

The importance of such an investigation was suggested to me by a study of the remarkable conditions under which human excreta was then disposed of in many of the large military stations in Upper India. The filth was disposed of by the shallow trench system, which is worked as follows: On a piece of land selected for the purpose one or two miles from the cantonments of the troops, a series of trenches, about 4 ft. wide and of suitable length, is dug to the depth of a foot. One or more trenches are prepared each day as may be required. The bottom of the trench is loosened, and the clods of the removed earth are well broken up.

The mixture of fresh fæces and urine is brought from the latrines in special closed iron carts drawn by buffaloes or bullocks. This removal ought to take place at night only, but is sometimes done by day also. On arrival at the trenches the fluid contents of the carts are tipped into the trench, which should be filled to a depth of not more than 3 in. The removed earth is at once replaced on the top of the filth. If this is properly done, the surface of the trench should remain dry, and little or no odour ought to be perceptible. It frequently happens, however, that owing to the laziness of the workmen, or to wet weather, the surface of the trench is moistened by the soaking up of the fluid, and more or less smell is appreciable.

It is claimed by the Indian Sanitary Authorities that by this method the most rapid destruction of excreta is effected, but it is unfortunate from another sanitary point of view that these shallow trenches are ideal breeding places for flies, and that consequently every cantonment employing the system is producing its own flies on an enormous scale. They swarm in myriads about the trenches in summer, and the carts, men, and animals employed are covered with flies, which accompany them to barracks on their return, the intestines of the flies full of human excrement that they have eaten as larvæ, and which they void on all the articles of human food which they may alight on afterwards.

As this wholesale fly-breeding arrangement was in action in most of the large cantonments in North India, the number of flies ready filled with human filth produced through the greater part of the year in the vicinity of barracks by an artificial and probably avoidable source was prodigious.

The habits of the flies seemed to be as follows: As soon as a trench was filled in, the flies laid their eggs on it. No eggs were visible on the surface, since the flies burrowed down into the crevices, but on turning over the small lumps of earth, little white masses of eggs, like snow, were found over the whole trench. In a few days the eggs were hatched, and the larvæ straightway burrowed down to the layer of excrement. So numerous were they at Meerut in the beginning of April, that on digging down about 6 in. a distinct layer of larvæ was found, feeding on the filth.

The flies seemed to prefer the newly-made trenches to lay their eggs on, and it would be interesting to try whether the spraying of the trenches with carbolic acid, or some such substance repellent to flies, would not keep them off till the trenches had lost their first attractiveness.

The laboratory experiments were carried out on the following lines:—

(1) Effect of confinement on normal flies.

(2) Effect of feeding with typhoid bacilli on the vitality of flies.

(3) Bacterial content of normal flies' viscera and dejecta.

(4) Length of time during which typhoid bacilli could be recovered from the bodies of infected flies.

(5) Length of time during which typhoid bacilli could be recovered from the fæces of infected flies.

(6) Similar experiments made with laboratory cultures and with fresh urine containing bacilli from a human carrier.

(7) To what extent flies may be mechanical carriers of typhoid bacilli on their bodies or feet.

The flies used all through were specimens of the common fly, *Musca domestica*, caught on the windows of the laboratory and other rooms of the Institute.

The bacilli employed were either a 24-hour culture of a highly agglutinating strain isolated from an English patient, or those contained in the fresh urine of a chronic carrier who was under observation at the Institute.

The media used were generally large plates of Drigalski-Conradi medium, and occasionally Conradi's fluid bile-glycerine-peptone, and a uniform period of twenty-four hours' incubation was adhered to, both in the preparation of cultures and for the examination of plates.

The typhoid bacilli were identified by Widal's reaction with the high titre serum used in the laboratory during the Enteric Fever Inquiry.

The difficulty and expenditure of time necessary

for making a very large number of plate cultures and their examination were lessened by the excellence of the media provided and the general efficiency of the laboratory arrangements as organized by Colonel Sir David Semple, the Director of the Institute.

Many more experiments were made than are detailed in the following notes, where only a few are described as typical examples of the average results obtained.

I.—Effect of Confinement on Normal Flies.

(1) Ten flies were caught in test-tubes, and placed in a wire gauze cage 6 in. square, supplied with milk, sugar and water, and kept on the table in the laboratory.

After 24 hours 7 were dead.
After 2 days all were dead.

(2) Twenty-five flies were put in a large box 3 ft. by 2 ft., with one side covered with muslin. They were fed as above.

After 24 hours all were alive.
After 2 days all were alive.
After 3 days all were alive.
After 4 days 21 were alive.
After 5 days 16 were alive.
After 6 days 10 were alive.

The mortality in the first case was probably due to the smallness of the cage.

The second experiment showed that half the number of imprisoned flies could survive for five days.

Incidentally it was noticed that in confinement the flies required a liberal supply of water. If this were not given they never lived long.

II.—Effect of Feeding with Typhoid Bacilli on the Vitality of Flies.

Two methods were employed.

(1) An emulsion of one small loopful of culture was made in half a watchglassful of various media, such as blood, fæces, milk, broth.

This emulsion was spread in a thin film on a slide, and allowed to dry before use. The flies could generally be got to feed freely if a trace of sugar were added to the fluid. The blood film was a favourite, and made a good hard surface which was not likely to soil the flies' feet with bacilli, although this source of fallacy was always present. A hungry fly could clean half a slide in a few minutes, and thus ingest a large dose of bacilli.

(2) The emulsion was given moist on filter paper. This method probably gave a very large dose, but infected the feet of the insect.

To ensure that all the flies observed actually ate the emulsion they were fed singly under a beaker, and all that failed to feed freely were destroyed. It was therefore certain that all the flies used had eaten a large number of bacilli.

Numerous flies were fed with typhoid emulsion, and on the whole no specially fatal action could be detected unless they took a very large dose, in which case they sometimes seemed to die from the direct effect of the micro-organism, or from the nature of the food. Given a roomy cage and plenty of water, the infected flies lived nearly as long as the normal flies, some surviving for five days.

In one experiment twenty-five flies were fed on blood emulsion dried on slides.

After 24 hours all were alive.
After 2 days 22 were alive.

These twenty-two flies were again fed *en masse* with moist milk emulsion on filter paper.

Subsequent to this second feed:—

After 24 hours 20 were alive.
After 2 days 15 were alive.
After 3 days 9 were alive.
After 4 days all were dead.

III.—Bacterial Content of the Viscera and Dejecta of Normal Flies.

(i) Viscera.—The method of examination was by the removal of the abdominal viscera, which were crushed in a few drops of normal salt solution, and incubated on Drigalski plates.

(1) Unfed flies contained uniformly on these plates an acid-producing coli-like organism, and clear colonies of an alkali-producing one, which microscopically was a fine rod resembling *B. typhosus*, but not giving any trace of agglutination with low dilutions of the specific serum, or other test reaction of typhoid.

(2) Flies fed on milk and killed the next day showed a great increase in the number of alkali-forming colonies.

Out of all the numerous uninfected flies examined, in no case did their viscera show any micro-organism which could be mistaken for the *B. typhosus*.

(ii) Excreta.—For these observations the flies were kept in wide-mouthed sterile bottles, covered with gauze.

It was observed that they defecated about once an hour, leaving a small yellowish or brownish spot on the glass. The dejecta passed at various times were got by changing the flies into fresh bottles.

The fæces were examined bacteriologically by washing the spots off with sterile normal salt solution and plating.

In both the fed and unfed fly the acid and alkali forming bacilli noted in the viscera were constantly present. After feeding on milk, the number of colonies of the alkaline one were greatly increased. After feeding on broth they were increased to a less extent.

In no case was any micro-organism found in the dejecta which could be mistaken for the *B. typhosus*.

IV.—Length of Time during which Typhoid Bacilli could be Recovered from the Bodies or Viscera of Infected Flies.

A large number of examinations were made on this important point, and over 100 flies were tested bacteriologically.

Sometimes the whole fly, or the alimentary canal only, was emulsified in sterile salt solution, and examined, both by plating direct, and by preliminary incubation in bile-glycerine-peptone (which causes a great proliferation of the bacilli) before plating.

Flies which died soon after feeding, and those that survived for several days, were tested, as also those fed on the emulsion with different media.

Controls were occasionally made from the slides immediately after feeding, and in every case a profuse growth of typhoid germs was obtained.

Without describing the experiments in detail, the following general result was obtained:—

(1) In the case of flies which died or were killed three hours after feeding the bacillus could be recovered in almost every case.

(2) In living flies killed twenty-four hours after feeding the bacillus was found in 30 per cent.

(3) Forty-eight hours after feeding, in no case was the micro-organism recovered.

The inference from the above experiments is that it is possible for flies which have fed on a rich emulsion of typhoid germs to infect human food with their bodies up to a period of twenty-four hours after such feeding. It is unlikely, however, that in natural conditions flies are liable to find such a rich culture of the germ as that administered to them, and that consequently their infective period would not be so prolonged.

V.—Length of Time during which Typhoid Bacilli could be Recovered from the Excreta of Infected Flies.

The excreta of flies fed on typhoid emulsion was examined at intervals, as described in No. III above.

The dejecta passed at different times was collected by transferring the flies to fresh bottles. The fæcal spots were washed off with sterile salt solution, and either plated direct, or first incubated in bile medium. The latter was the more certain method for the testing of fæces, as two or three typhoid colonies might be overlooked, when several hundred could not. Destruction of the bacilli in the alimentary canal evidently took place very soon, as the number of bacilli recovered was never as large as might have been expected.

Many experiments were made under this head, and the general result was that the *B. typhosus* could be recovered in about 50 per cent. of the excreta passed up to six hours after feeding, but never in that passed twenty-four hours after feeding.

The following is an instance of four flies fed on blood emulsion dry on a slide:—

Excreta passed in hours after feeding	Number of colonies of typhoid found on plating the excreta direct				
	Fly 1	Fly 2	Fly 3	Fly 4	Fly 5
3 hours	—	7	9	—	4
6 ,, ...	2	2	4	—	1
24 ,, ...	—	—	—	—	—

In these tests it was impossible to eliminate the chance of the flies infecting their dejecta with their feet, which might have removed some bacilli from the film, but since the blood-film dried with a good hard surface that fallacy was unlikely in every case.

With reference to the recovery of typhoid bacilli passed with excreta in a bottle, the following control experiment as to the vitality of the bacillus under similar conditions was made:—

On the inside of a sterile glass bottle small spots of fresh typhoid broth culture about the size of a fly's droppings were made with a small platinum loop. The bottle was covered with perforated paper, and left on the bench along with those containing the flies.

The spots of dry culture were then examined at twenty-four hour intervals by washing off with sterile salt solution and plating direct, with the following result:—

	Experiment I	Experment II
24 hours ...	3 colonies typhoid ...	Numerous colonies
48 ,, ...	4 ,, ,, ...	17 ,,
72 ,, ...	No ,, ,, ...	No ,,
96 ,, ...	No ,, ,, ...	No ,,

The above experiments are interesting, as they show in the first place, that if bacilli are present in the excreta of flies it ought to be possible to detect them two days after deposition if kept under the same conditions as in the test experiments; and, secondly, that desiccation and exposure to light seems to be fatal within three days to the bacilli in the spots of dry broth.

The inference from these excreta tests is that it is possible for a fly, after a meal of matter containing the typhoid organism, to infect human food of suitable material for some hours after feeding by defecating thereon.

VI.—Flies Fed with Fresh Urine from a Case of Typhoid Bacilluria in a Human Carrier.

The opportunity was taken of using a natural typhoid culture in urine from Case No. 645, a soldier who was under observation at the Institute, and who had a high degree of bacilluria.

(1) Two flies were fed on the fresh urine containing forty million bacilli per c.c. spread on filter paper. The flies would not suck the pure urine, but did so when a trace of milk and sugar were added to it.

They were alive twenty-four hours later, when they were killed, and their alimentary canals placed after incubation in bile medium.

Fly A ... Numerous typhoid colonies.
Fly B ... No typhoid colonies.

(2) Six flies were fed as above.

The next day three were dead, and two of the dead ones were plated:—

Fly A ... A few typhoid colonies
Fly B ... No typhoid colonies.

The remaining flies were alive two days after feeding. Two were killed and plated:—

Fly A ... No typhoid colonies.
Fly B ... No typhoid colonies.

(3) The bacterial content of the urine of Case No. 645 having fallen to six million bacilli per c.c., ten flies were fed as above.

Twenty-four hours later they were all alive. Two were killed, and their viscera plated:—

Fly A	...	A few typhoid colonies.
Fly B	...	No typhoid colonies.

The excreta of two flies were examined:—

Fly A	...	No typhoid colonies.
Fly B	...	No typhoid colonies.

The eight remaining flies were fed on milk and sugar, and twenty-four hours later, two days after feeding on the typhoid urine, they were all alive.

Two were killed and plated:—

Fly A	...	No typhoid colonies.
Fly B	...	No typhoid colonies.

The above experiments show first that urine containing typhoid bacilli has no specially evil effect on flies; and, secondly, that flies can retain the living organism for twenty-four hours when derived from urine apparently more frequently than from an artificial culture, although this is probably only accidental.

VII.—How far Flies may be Mechanical Carriers of Typhoid Bacilli on their Bodies or Feet.

The method employed for this test was to let flies walk about on filter paper moistened with a twenty-four hour broth culture of typhoid, or with urine from Case No. 645.

The flies were put singly on the paper under a glass and watched. Any which fed on the broth were rejected as liable to complicate the observations.

They were permitted to run over the paper for times varying from thirty seconds to two minutes.

They were then transferred to cages or clean glasses, kept there for various periods, and subsequently allowed to run over the surface of Drigalski medium in Petri dishes. The dishes were then incubated and examined as usual.

A number of experiments were made, of which the following are detailed:—

(1) Four flies were put on typhoid broth paper for one minute each, and transferred to a cage.

Two hours afterwards they were run over separate Drigalski plates for five minutes, and the colonies of typhoid counted after incubation:—

Fly A	...	16 typhoid colonies.
Fly B	...	2 typhoid colonies.
Fly C	...	11 typhoid colonies.
Fly D	...	4 typhoid colonies.

(2) Three flies were put on typhoid broth paper for one minute.

Six hours afterwards they were run over plates for five minutes:—

Fly A	...	2 typhoid colonies.
Fly B	...	6 typhoid colonies.
Fly C	...	No typhoid colonies.

Advantage was taken of the naturally infected typhoid urine from the bacilluria Case No. 645 for this series of observations.

The fresh urine containing forty million bacilli per c.c. was used to moisten the filter paper, and all flies which fed were rejected as before.

(1) Four flies were run on the urine paper for thirty seconds.

One hour later they were put on Drigalski medium for five minutes.

Fly A	...	22 typhoid colonies.
Fly B	...	6 typhoid colonies.
Fly C	...	10 typhoid colonies.
Fly D	...	19 typhoid colonies.

(2) Three flies were put on the urine paper for thirty seconds.

Three hours afterwards they were put on Drigalski medium for five minutes.

Fly A	...	4 typhoid colonies.
Fly B	...	12 typhoid colonies.
Fly C	...	No typhoid colonies.

(3) Three flies were put on the urine paper for thirty seconds.

Twenty-four hours later they were run over Drigalski medium for fifteen minutes.

Fly A	...	No typhoid colonies.
Fly B	...	No typhoid colonies.
Fly C	...	No typhoid colonies.

It may be considered possible therefore that flies which have walked either upon artificial cultures of typhoid bacilli, or on the urine of a bacilluric person, may carry away on their feet or bodies bacilli which render them capable of infecting suitable human food by running over it for at least six hours afterwards.

The fact that flies apparently do not readily feed on urine is no safeguard, as the above tests of foot-contamination prove. Flies hang about urinals and urine spilt on the ground in great numbers; and in view of the prevalence of bacilluria among typhoid patients, convalescents and carriers, and of the difficulty of controlling the place of micturition and the disposal of the urine in such cases, these results seem most suggestive.

General Summary.

The conclusions which may be drawn from the foregoing experiments are summed up as follows:—

(1) The ingestion of typhoid germs in large numbers has no bad effect on the health of flies.

(2) They can retain living typhoid bacilli within their bodies, and transmit infection thereby for a period of twenty-four hours after ingestion.

(3) They can carry the living germs on the exterior of their feet or bodies for a period of six hours, and so transmit infection.

(4) As research tends to show that the *Bacillus typhosus* possesses no great saprophytic vitality, the presence of the germ in any substance or locality

indicates its comparatively recent derivation from man, in whose excreta it emerges.

(5) Given the acute typhoid case, the convalescent, or the carrier, as a focus of infection, there may be many channels by which it is spread; but, as far as our knowledge takes us at present, it is quite possible that the common fly is a very important factor in the transmission of the disease through the contamination of food.

(6) It is advisable, therefore, to endeavour to reduce the number of flies by preventing their having good breeding places, and to keep food supplies, especially milk, under suitable protection from contamination by them. This is particularly important in regard to barracks of British troops in India, where the method of filth disposal by shallow trenches seems most undesirable from the fly reduction point of view, as it not only increases the number of flies in the vicinity of cantonments, but also turns them out ready filled with human excreta.

REPORT ON THE TREATMENT OF TWENTY-TWO CASES OF YAWS, BY SALVARSAN INJECTIONS, AT THE YAWS HOSPITAL, ST. GEORGE'S, GRENADA, W.I.

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DURING the past four months a series of cases have been treated at the Yaws Hospital, Grenada, with salvarsan injections, and I beg to submit the results so obtained by this treatment.

The injections throughout the series have been given intramuscularly; and the method of preparing the salvarsan for injection, that suggested by Taege, with a slight modification. With the exception of cases Nos. 17 and 19, no ill-effects have resulted from the treatment.

In these two cases, however, some degree of arsenical poisoning was noted, and although the disease for which the injection was made improved rapidly, the general condition of the patients gave cause for much anxiety.

Both cases eventually recovered and were discharged twenty-seven days after the date of the injection.

The cause of these symptoms arising in these two cases (if one assumes that the drug was contaminated) and not in the third case, a younger child, injected with the same dose, from the same tube, on the same date, is inexplicable—unless one presumes that case No. 18 enjoys a natural tolerance of arsenic.

Cases Nos. 3 and 7 are of interest as displaying the efficacy of salvarsan in the treatment of chronic yaws. Both cases had been under treatment in the Yaws Hospital for about eighteen months with practically no result whatever. Under salvarsan both cases improved rapidly and were discharged cured seventeen and twenty-nine days respectively after injections.

The only case of the series requiring a second

No.	Name	Age	Sex	District	First attack or recurrent	Dose	Site of injection	Date of injection	Date of discharge	Remarks
1	A. P.	25	M.	St. John's	Recurrent	0.6 grm.	Gluteal	Jan. 18, 1912	Feb. 15, 1912	
2	E. F.	7	,,	,,	1st attack	0.3 ,,	,,	Feb. 5, 1912	Mar. 6, 1912	
3	E. K.	11	,,	St. George's	,,	0.3 ,,	,,	,, ,,	Feb. 22, 1912	Had been under treatment for 18 months in Yaws Hospital previous to injection.
4	C. A.	18	,,	,,	Recurrent	0.6 ,,	,,	Feb. 22, 1912	Mar. 21, 1912	
5	H. H.	15	,,	St. John's	,,	0.3 ,,	,,	,, ,,	—	No progress made until second injection was made.
						0.4 ,,	,,	Mar. 26, 1912	Apr. 16, 1912	
6	A. M.	8	F.	St. George's	,,	0.3 ,,	,,	Feb. 22, 1912	Mar. 20, 1912	Had been well over 10 days before discharge.
7	K. W.	13	,,	,,	1st attack	0.3 ,,	,,	Mar. 6, 1912	Mar. 25, 1912	Had been in Hospital for 17 months before injection.
8	A. L.	10	M.	,,	Recurrent	0.3 ,,	,,	Mar. 18, 1912	Apr. 16, 1912	
9	E. J.	16	,,	St. David's	1st attack	0.5 ,,	,,	Mar. 6, 1912	,, ,,	
10	J. N.	14	F.	,,	,,	0.3 ,,	,,	,, ,,	Mar. 25, 1912	
11	J. A.	37	,,	,,	,,	0.6 ,,	,,	Mar. 18, 1912	Apr. 11, 1912	Had recovered 7 days before discharge but awaited No. 14.
12	H. J.	32	M.	St. Patrick's	,,	0.6 ,,	,,	,, ,,	Apr. 1, 1912	
13	C. F.	5	F.	St. John's	?	0.15 ,,	,,	,, ,,	Apr. 16, 1912	
14	F. A.	4	M.	St. David's	?	0.15 ,,	,,	,, ,,	Apr. 11, 1912	
15	M. C.	10	,,	,,	Recurrent	0.4 ,,	,,	Mar. 26, 1912	Apr. 30, 1912	
16	O. D.	9	,,	St. George's	1st attack	0.4 ,,	,,	,, ,,	,, ,,	
17	A. M.	6	F.	St. Andrew's	,,	0.2 ,,	,,	Apr. 13, 1912	May 10, 1912	Had prolonged reactionary period.
18	J. G.	3	M.	St. David's	,,	0.2 ,,	,,	,, ,,	,, ,,	
19	M. J.	7	,,	St. Andrew's	,,	0.2 ,,	,,	,, ,,	,, ,,	Had prolonged reactionary period.
20	R. A.	6	,,	St. Mark's	,,	0.15 ,,	,,	Apr. 15, 1912	May 3, 1912	
21	H. S.	12	,,	St. Andrew's	,,	0.3 ,,	,,	Apr. 18, 1912	May 10, 1912	
22	I. C.	10	,,	St. David's	,,	0.3 ,,	,,	,, ,,	May 3, 1912	

Average stay in Hospital 25½ days.

injection was that of No. 5. The disease in this case remained practically stationary until the second injection (a larger dose of 0.4 grm.) was administered.

No abscesses at the site of injection have resulted, and the pain experienced by the method employed is reduced to a minimum.

It may be of interest to note that in three cases which were examined the spirochætes disappeared from the tissues within forty-eight hours of the injection being made.

In the case of No. 5 the spirochætes were found after the first injection but disappeared within forty-eight hours after the second injection, the cause being, I take it, that an insufficient dose was administered on the first occasion.

The duration of patients' stay in the hospital, after injections, averages out at twenty-five and a half days, as against an average of about three months under other modes of treatment.

With regard to "duration of stay" in hospital, it must be remembered that practically all yaws cases here are infected with ankylostomiasis, and that removal of these parasites is necessary as a preliminary to any treatment by salvarsan.

INOCULATION, VACCINATION AND SMALL-POX.

By Lieutenant-Colonel R. H. Castor, I.M.S.
Burma.

It is well known that inoculation is still present in many parts of Burma. Its practice, extent and relative incidence to vaccination and small-pox I do not think has recently been commented on; I will therefore endeavour to bring out some salient facts regarding their connection with one another in Burma.

Inoculation

has been practised from "time immemorial," and its many advantages are known to most people, but apparently there still exist some individuals unconvinced of its results. I see it stated in the *British Medical Journal* that Mr. James McGhee offers £10 to any charity if anyone succeeds in inoculating him "with the secretion of the pustules of small-pox." If Mr. McGhee wishes to have an ocular demonstration of this fact without in any way risking his valuable life he should visit Burma, where he will find not one, but many cases showing him the results of inoculation in a *marked* manner, though it is of course well known, and these statistics will show it, that every case of inoculation does not produce small-pox, so that he is fairly safe in his offer.

In Lady Montagu's graphic account of the practice then prevalent she says "that every year thousands undergo the operation and that they take the small-pox here (*i.e.*, Constantinople) by way of diversion, as they take the waters in other countries." When she had her infant daughter inoculated in England the event excited the greatest interest in medical and fashionable circles. The Princess of Wales then followed suit, so that it is evident that inoculation was practised from the highest to the lowest in the land. Inoculation also received the scientific consecration of the Royal College of Physicians of London.

In France, inoculation was forbidden by law in 1763. In England, it was prohibited by law in 1840. In this country the first Act against inoculation was only passed in 1908, and still there are many areas to which this Act is not extended, so that we are sixty-eight years behind England in this respect.

Vaccination

is constantly debated upon, not only in the House of Commons, but in many parts of Burma. We are often told that the general diminution in small-pox is due to more efficient sanitation. This explanation cannot hold good for this country, where filth and insanitation abound; and yet small-pox does not produce the ravages it did before; and where vaccination is most practised, there small-pox is most reduced. Vaccination was proposed in England in 1798, but the first Vaccination Act was only passed in 1853 in England, and ten years later in Scotland and Ireland. In 1898 the retrograde Act allowing "conscientious objectors" was passed. The first Vaccination Act affecting this country came into force in 1880, so that we are not quite so far behind in vaccination as we are in inoculation.

Small-pox

during the last ten years averaged 2,900 cases annually for this province, but these numbers are a good deal short of the actual number of cases that occurred, as registration was only enforced in Upper Burma recently. The highest figures were for the year 1906 (6,610 cases) and the year 1900 (5,215 cases). The lowest figures were for the year 1908 (1,184 cases). These figures are taken from the Blue books.

Carelessness in reporting the vaccinal state of the patients attacked with small-pox has furnished in the past, as it will furnish in the future, food for the carping anti-vaccinationist. Usually the patient's or the parents' word is taken to prove that the person attacked was previously vaccinated, or the patient was vaccinated when small-pox was actually present in the village or adjacent village. These cases are mingled together to show that small-pox occurs in vaccinated persons, quite forgetting that the usual incubation period of small-pox is twelve days, and that it may extend to twenty days in some cases.

When one can get accurate figures they refute these erroneous statements.

Total Cases Examined and their Ages.

The number amounted to 1,028 persons. Of these 517 were Upper Burmans, 393 were Lower Burmans, and 118 were Shans. Their average age was 30 years; the youngest was 14 years, and the oldest 75 years.

Inoculation.

Total Number Inoculated.

For Upper Burmans this came to 243, or 47 per cent.; Lower Burmans 217, or 55 per cent.; and Shans 18, or 15 per cent. The total percentage for Burmans only came to 50.6. In India at one time the percentage inoculated rose to 81 per cent. The above figures show that inoculation is more prevalent in Lower than in Upper Burma, and least so in the Shan States.

Ages Inoculated.

Under 5 Years.—In Upper Burma 70, or 28 per cent., were inoculated; in Lower Burma 48, or 22 per cent. were done; and among Shans 2, or 11 per cent.

Between 5 and 10 Years.—In Upper Burma 167, or 68.77 per cent.; in Lower Burma 164, or 75.5 per cent.; and Shans 15, or 83.3 per cent.

Between 10 and 20 Years.—In Upper Burma 6, or 2.4 per cent.; in Lower Burma 5, or 2.3 per cent.; and Shans 1, or 5.5 per cent.

These figures show that inoculation is carried out chiefly between the ages of 5 and 10 years, that it is resorted to at a lower age in Upper than in Lower Burma or the Shan States, and that over 10 years it is practised more in the Shan States than in Burma.

Cases of Small-pox after Inoculation.

The number of cases among Upper Burmans came to 13, or 4.1 per cent.; among Lower Burmans 9, or 4.1 per cent.; and among Shans 1, or 5.5 per cent. It is therefore more common among the Shans than among Lower Burmans and Upper Burmans, the explanation being that inoculation produces its worst results in countries least protected by vaccination, as will be seen in this paper.

Operation of Inoculation.

The operation needs no description, but the following particulars are interesting: The instrument used in ninety-seven cases was a thorn; in thirty-four cases the needle for tattooing; in three cases a piece of broken bottle. In the remaining cases no accurate information could be obtained. In this connection one may allude to the many other instruments and devices used in olden times for this purpose. In Scotland, for example, threads steeped in variolous matter were tied round the wrist. In China "small-pox was sewn" by introducing crust from small-pox pustules into the nasal passages of young children. In Constantinople bits of shell were employed, and so forth.

Inoculators.

The great majority of these were the regular inoculators of the country. In four cases the father was the operator, and in two others a relative. In no cases were women employed. In Constantinople "old women made it their business to perform the operation." In India it was often "left to ignorant women."

Fees for Inoculation.

The majority paid four annas, some eight annas, and a few one rupee for the operation. In other cases the operation was done free of charge.

Time for Inoculation.

It was invariably done when small-pox was about. In only twelve of the cases was it done when no small-pox was present. There were no special precautions taken previous to the operation, neither were special months devoted to it. It may be recalled that both in England and India special precautions were taken, and in India the month of March and later were specially favoured for this purpose.

Position of Inoculation Marks.

Among Upper Burmans they were found on the right forearm in 50 cases, on the left forearm in 151 cases, both arms 39, and on the legs in 3 cases. Among Lower Burmans they were found on the right forearm in 60 cases, left 54 cases, both 101 cases, and in 2 cases on the leg.

Among the Shans the right forearm had been selected in 14 cases, left forearm in 3 cases, and both arms 1 case; none were found on the leg.

The grand totals are, therefore, for the left forearm 208, both arms 141, right forearm 124, and legs 5. These figures show that the Upper Burmans prefer the left forearm, the Lower Burmans both forearms, and the Shans the right forearm; the most favoured site is the left forearm.

The *actual position* on the forearm varies; most often it is situated just above the wrist, the next in favour being a few inches below the elbow, and less frequently in the centre of the forearm.

The *marks* are almost invariably placed on the flexor surface of the forearm, occasionally on the extensor surface below the elbow.

The *number of marks* is rarely more than one for each forearm. In only 5 cases were 2 found.

In 5 cases the legs had been inoculated, in 3 cases the right leg, in 1 case the left leg, and in the other case both legs. Of these cases 3 were Upper Burmans and 2 were Lower Burmans. The *site inoculated* in these cases was again the flexor surface of the legs and about their middle.

In one case only were both the forearms and both the legs inoculated; this patient is marked with small-pox on the face. In another case the left forearm and left leg were inoculated; this patient did not get small-pox.

To compare these positions with those employed in olden time, the Grecians used to make four wounds, one in the middle of the forehead, one on each arm, and one on the breast to mark "the sign of the cross." In India they preferred the outer side of the forearms between the wrist and the elbow, and the shoulder for females.

Keloids after Inoculation.

None.

Vaccination.

Total Number of Cases before 14 Years of Age.

Of the total number of cases examined only 84 or 8.7 per cent. were vaccinated before the age

of 14 years. It was most frequent among Upper Burmans, 10.6 per cent.; then Lower Burmans with 6.6 per cent., and Shans with only 2.5 per cent.

Ages Vaccinated.

Under 5 Years.—Upper Burmans, 19 or 3.6 per cent.; Lower Burmans, 8 or 2 per cent.; and Shans, 1 or 0.8 per cent.

Between 5 and 10 Years.—Upper Burmans, 26 or 5.2 per cent.; Lower Burmans, 17 or 4.3 per cent.; and Shans, 2 or 1.6 per cent.

Between 10 and 20 Years.—Upper Burmans, 8 or 1.5 per cent.; Lower Burmans, 1 or .2 per cent.; and Shans none.

Vaccination, therefore, was carried out most frequently between the ages of 5 and 10 years (4.3 per cent.) and most practised among Upper Burmans (8 per cent.); then Lower Burmans (6 per cent.), and Shans (2.5 per cent.). It will be noticed that inoculation was also carried out most often at these ages. Vaccination, like inoculation, is also resorted to at a younger age in Upper than in Lower Burma.

Cases of Small-pox after Vaccination.

There were 9 cases that were reputed to have had small-pox after vaccination. Of these 7 were Upper Burmans and 2 Lower Burmans; no Shans. As there is a good deal of misunderstanding on this point by some persons, these cases were fully gone into, and it was found that only two had good marks of vaccination. One of these had three marks, and the other had two. I will now deal with these cases more in detail.

(1) *Kind of Marks.*—Two had good marks; one had satisfactory marks; four had fair marks; one had indistinct marks; and one had no marks at all.

(2) *Ages Vaccinated.*—One was done at 3 years, two at 5 years, two at 7 years, two at 8 years, and two at 10 years.

(3) *Time Small-pox appeared after Vaccination and Result.*—In two of them it appeared within fifteen days after vaccination, in five of them within a month, in one of them within three months, and in the last within four months.

In the two with good marks of vaccination, small-pox appeared within one and three months respectively. Further, in one of these cases the small-pox marks were slight on the face, and in the other it was not possible to say whether the patient had had small-pox or not. In the one with satisfactory marks small-pox appeared within a month after vaccination, but the marks were very slight on the face.

In three other cases the marks were also slight on the face, but the remaining three were badly pitted.

(4) *Prevalence of Small-pox.*—In six of the cases small-pox was prevalent in the adjoining village, and in the other three cases small-pox was in the village. In three of the cases with good and satisfactory marks small-pox was prevailing in the villages round.

It is clear, then, from these remarks that only two, or perhaps three, had small-pox after vaccination had *been properly carried out*, and this comes to 2.3 per cent. of the cases.

All these three cases were Upper Burmans. It must not be forgotten that the parents of this country are very fond of rubbing away the lymph and inserting juices of different kinds into the punctures. This results in irritable ulcers and scars, whose cicatrices resemble those of vaccination so closely that it is not always easy to discriminate between them.

I may add also that not one of these cases came quite up to the standards fixed for good marks of vaccination, viz., that the total area of vaccination is not to be less than half a square inch, and that four separate good-sized vesicles not less than half an inch from one another should be the result.

Keloids after Vaccination.

There were no true keloids produced, but in 40 or 15 per cent. of them fibroid masses raised above the surface of the vaccination scars were found. In Upper Burmans 19 or 13.3 per cent., Lower Burmans 15 or 13.2 per cent., and in Shans 6 or 75 per cent. It is apparent, therefore, that these fibroid masses develop most in Shans, then in Upper Burmans, and then Lower Burmans. I can offer no satisfactory explanation of this fact.

Vaccination in Adult Ages.

Of the 517 Upper Burmans, vaccination marks were visible in 27 per cent. of them; in Lower Burmans 28 per cent.; and for Shans only 6 per cent. Vaccination is, therefore, least successful in Shans, and yet they show the highest percentage for the fibroid masses which appear on the vaccination scars. Vaccination is slightly more successful among Lower Burmans than Upper Burmans at adult age.

SMALL-POX.

Of all the cases examined 170 or 16 per cent. had had small-pox. Of these, 92 or 17 per cent. were Upper Burmans; 43 or 11 per cent. were Lower Burmans; and 35 or 29 per cent. were Shans. Small-pox, therefore, was most prevalent among the Shans—the area least protected by vaccination—and least abundant among Lower Burmans, the best protected area.

Ages at which Small-pox was Contracted.

The disease was most common between the ages of 5 and 10 years for all the classes; first, among the Shans, 17 per cent., then among the Upper Burmans, 11 per cent., and then Lower Burmans, 6 per cent.

Under 5 Years.—It occurred in the same order of frequency as above mentioned; Shans 3.3 per cent., Upper Burmans 3.8 per cent., and Lower Burmans 1 per cent.

Between 10 and 20 Years.—During this period

it was most common among the Shans, 8 per cent., Lower Burmans 2.7 per cent., and Upper Burmans 2.3 per cent.

Between 20 and 30 Years.—There are no cases to record among Shans. For Lower Burmans it came to 0.5 per cent. and Upper Burmans 0.3 per cent.

Small-pox is, therefore, most common between the ages of 5 and 10, then under 5 years, this being most marked among the Shans, then Upper Burmans, and then Lower Burmans. Between 10 and 20 years, among the Shans most frequently; and between 20 and 30 years, more frequently among Lower than Upper Burmans.

Number of Eyes Affected.

Of these 170 cases who had had small-pox 7 or 4.7 per cent. had their eyes affected, most frequent among Upper Burmans, 6 per cent.; then Shans, 2.8 per cent.; then Lower Burmans, 2.3 per cent. I cannot explain why there should be such a marked difference between Upper Burmans and Shans in this respect, except that it will be seen later in the paper that of these races Upper Burmans are also the most frequently pitted with small-pox; that being so, the type of small-pox must be more virulent in Upper Burma than in either of the other areas.

Eyes Attacked and Result.

The right eye was affected in four cases, the left eye in three cases, and both eyes in one case. In three cases the sight was gone and the globes were getting atrophied. In the other five cases there was a certain amount of vision, but the leucoma was very distinct. The three cases mentioned above were badly pitted in the face, the remaining cases were more or less slightly so.

Besides these cases, there is a patient now in hospital, an Upper Burman, whose right eye is destroyed altogether from small-pox, and he gives the history of having been inoculated at the age of 9 years, and that three days after inoculation he got an attack of small-pox. He is also badly pitted with small-pox marks on the face. He further states that there is another man in his village who has unfortunately met with the same treatment from this disease.

Deafness.

There were no cases to record.

Number Pitted with Small-pox.

Of the cases attacked 59.4 per cent. were pitted. The Upper Burmans accounted for 60 per cent., Lower Burmans 58 per cent., and Shans 57 per cent. The face was the most marked part of the body. In the other parts the marks were comparatively slight, and few and far between.

SUMMARY OF RESULTS.

Inoculation.

It will be seen that 50 per cent. of Burmans are inoculated, as against 15 per cent. of Shans. The practice is more common in Lower than Upper Burma. Upper Burmans get inoculated at a younger age than either Lower Burmans or Shans. Small-pox after inoculation occurs in 5.6 per cent. of the cases, and more frequently among the Lower Burmans than the Upper Burmans and Shans. The thorn is the most favoured instrument used for inoculation. It is carried out by the regular inoculators at a fee usually of 4 annas per case. There are no women operators. It was invariably resorted to when small-pox was present in or around the village and with no precautions. The site of selection was most often the left forearm, then both arms, and then the right forearm. Very few cases were done on the legs, and the right leg was chiefly selected in these cases. The Upper Burmans preferred the right, the Shans the left, and the Lower Burmans both forearms. The marks, limited to one, were principally found above the wrist on the flexor surface of the forearms. They produced no fibroid masses.

Vaccination.

Vaccination before 14 years of age was found only in 8 per cent., and was most resorted to among the Upper Burmans, then the Lower Burmans, and then Shans. Upper Burmans get vaccinated at a younger age than either Lower Burmans or Shans. Small-pox after vaccination occurs in only 2.3 per cent. of cases, and they were only seen among Upper Burmans. Vaccination is slightly more successful in Lower Burmans than Upper Burmans or Shans. On the other hand, the Shans develop fibroid masses after vaccination more frequently than the Burmans.

Small-pox.

This disease occurs in 16 per cent. of cases, and is most prevalent among Shans, and least so among Lower Burmans. It is most common under the age of 10 years, and most frequently seen amongst the Shans, then Upper Burmans, and then Lower Burmans. Small-pox after inoculation occurs most frequently among the Shans and in 5.6 per cent. of the cases. Small-pox after vaccination only occurs among the Upper Burmans in 2.3 per cent. of the cases. In 5 per cent. of the cases the eye is affected, chiefly the right, and this is found more among Upper Burmans than either Lower Burmans or Shans. None of these cases of eye injury had been inoculated or vaccinated. There were no cases of deafness. Pitting after small-pox occurred in 59 per cent. of those attacked, and was most often seen among Upper Burmans, and least seen among the Shans, but there was very little difference between these two races.

The conclusion of the whole matter is this, that inoculation is resorted to most in Lower Burma, vaccination is performed most in Upper Burma, and that small-pox is most common among the Shans.

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THE JOURNAL OF

Tropical Medicine and Hygiene

SEPTEMBER 16, 1912.

THE CHINESE REPUBLIC AND WESTERN MEDICINE.

ALL eyes are at present turned to China, and in no sphere of work is this more prominently the case than in that of the future of medicine in that country. The desire for everything new in a country emerging from a system of thought and action dating from the earliest times is readily understandable, and it is surely not an unpardonable offence were the Chinese, in their haste to modernize, here and there to overdo the attempt beyond what may be wise and seemly. That there may be too great a desire and endeavour shown in some directions would seem inevitable, but in the department of medicine this is quite impossible. From the high place they held some 2,000 years ago in both surgery and medicine, in which operations and clinical observations played a prominent part, the art and science of medicine amongst the Chinese has dwindled with the passing of centuries until it has lost all claim to be regarded as even an art, and far less any pretensions to be scientific in any sense. Since the great Chinese encyclopædia was written it is doubtful if any man practising medicine in China on the old lines has written anything of any value, added one new fact to science, or advanced our knowledge by a single clinical observation of any kind. What was once an honourable calling has degenerated in China to a mere trade practised in ignorance; surgery has disappeared altogether, for no Chinese practitioner, untrained in Western methods, in these later days would dream of even amputating a finger, be it ever so necessary. There can, therefore, be no undue haste in getting rid of the system of medicine in vogue in China, and of those who have traduced the ancient *régime*. That the wise men in China know this is evident; for some forty years now young men have been sent abroad to acquire a knowledge of modern medicine and surgery, and there are a fair sprinkling of Chinamen practising medicine in their own country who have studied at universities in Europe and America. These men will serve as the pioneers and teachers of modern medicine in China, and in the several schools and universities they are doing excellent work. The oldest systematic attempt to introduce teaching in medicine on a university basis in China was in 1887, when the College of Medicine for Chinese in Hong Kong was opened with a complete staff of teachers, a botanist to teach botany, a chemist to teach chemistry, an anatomist to teach anatomy, and so on through all the branches of medical and surgical teaching. In no other part of China was it possible to have special teaching of the kind at that time, and the British Crown Colony of Hong Kong, if it brought no other advantage to China, justified its being by bringing to the doors of China the possibility of an education in the natural sciences, and the opportunity of studying medicine in a scientific manner. It is interesting to note that three of the best known names in China to-day are doctors, men who by precept and example have helped to modernize China more than any other of their countrymen, Dr. Sun Yat Sen, Sir Kai Ho Kai, K.C.M.G., and Dr. Lun Beng Kong. The name of another medical man who has already played, and is destined in future to play, a prominent part in China, namely, Dr. George Morrison, might be added to the list of medical men who have helped to shape modern China.

A doctor's training gives, perhaps, the most wide and liberal education possible to be conceived. Every branch of learning is brought within the scope of his requirements; classical languages are a necessity for the nomenclature and the technicalities of his profession; one or two modern languages it is imperative to know; for the medical officer of health civil engineering is an important factor, and the natural sciences are the very foundation of his knowledge. His position in society demands an acquaintance with general literature, and travel is a part of his educational curriculum he cannot neglect. Close and intimate acquaintance with mankind in health and disease, and in many phases of life, gives also a humanity to all his conceptions and ideals which shape his character and mould his instincts. The three Chinamen who figure so prominently in China to-day have all had the above training; they are no political hacks or blatant

orators; they have gained an ascendancy, in a country in which learning is a passion, from the fact that they are the best educated men in China to-day, and their humanity has guided their countrymen through a time of revolution to which the word bloodless is freely given all over the world. Doctors are for ever told that they are not business men, that they are outside the pale of politics, and have no power in that direction. The legend is untrue, and never was the fact brought more prominently to the fore than in China to-day. It is no exaggeration to say that China's reformation is in a large sense due to the fact that these men had a medical education, an education at once liberal and humanizing to a degree otherwise unattainable. The lesson may tell elsewhere, and it is to be hoped nowhere more speedily and prominently than in Britain. The needs of the State and of the people are known to no class of the community so well as to medical men; yet is this knowledge wasted and the professional politician is left master of a situation for which his training is inadequate and his knowledge founded on hearsay.

In China many educational institutions are springing up, and it behoves the Chinese to see that the medical branch of education is efficient. There are also rival bodies at work, not, it may be added, a regrettable incident. Perhaps one of the anomalies of the time, which has its amusing side also, is the attempt to raise funds to establish a university in the British Colony of Hong Kong, and another scheme for raising funds for endowing educational institutions on a university model in China itself. At a public meeting in Hong Kong the British Governor was explaining that as the Chinese were to be the gainers by the university to be established there they ought to contribute the funds; whilst at a gathering at the Mansion House, London, under the presidency of the Lord Mayor, for the building and endowment of a university in the interior of China, the Chinese Minster was asking the British folk for money to accomplish the object. Surely it would be more consistent were Chinese money to go to the university in China itself, and British money to the university in the British Colony of Hong Kong. True, both are to benefit the Chinese, but it would be British money well spent to equip a university in Hong Kong of the very highest possible type and efficiency. The prestige attained thereby to Britain amongst an education-loving people, such as the Chinese are known to be, would be greater than any show of might or the glory attaching to battles fought and won.

We anticipate that amongst the Chinese, as has already occurred amongst the Japanese, we will find keen intellect and original observers; and that in China in a few years we will have men corresponding to Kitasato, Oyama, Takaki, and many others who in Japan have raised medicine to a high position and given the world many new discoveries.

Annotations.

Bugs and Bubonic Plague.—In the *Medical Record* (July 27, 1912) Manning draws attention to the part played by bed bugs in the transmission of bubonic plague. He quotes Verjbitski on the subject, and gives that authority's results of sixty recorded experiments. Verjbitski's summary is as follows: "(1) All bedbugs and fleas which have sucked the blood of animals dying from plague contain plague microbes. (2) Bedbugs and fleas which have sucked the blood of animals suffering from plague contain plague microbes only when the bite is inflicted twelve to twenty-six hours before death, that is during that period when the blood contains plague bacillus. (3) The vitality and virulence of the plague microbe are preserved in these insects. (4) The plague bacillus is found in bugs which are not starved, one to seven days; in bugs previously starved four months, they are found eight to nine days. (5) The number of plague bacilli increases the first few days. (6) The fæces of the infected bug or flea contain virulent plague bacilli as long as they persist in the alimentary canal of the insect. (8) The more virulent the culture with which is inoculated the first animal on which the bug was fed, the more certainly the infection was conveyed by bites. (9) The local inflammatory reaction in animals which died from plague occasioned by bites of infected insects was very slight or absent. In the latter case one could only locate it by the situation of the primary bubo. (10) Infected bugs communicated disease to healthy animals five days; fleas three days. (11) Not more than two animals were infected from the same bug. (12) Crushing of infected bugs *in situ* in process of biting, occasioned, in the majority of cases, the infection of healthy animals. (13) Injury to the skin occasioned by the bite of the bug or flea offers a channel through which the plague bacillus can easily enter the body and occasion deaths from plague. (14) Crushed infected bugs and their fæces can infect small punctures of the skin caused by bites for a short time after infliction of bites. (15) On linen soiled by crushed bedbugs (or fleas) or their infected fæces the plague bacillus can under favourable conditions remain alive and virulent for five months. (16) Chemical disinfectants do not in the ordinary course of application kill the plague bacillus in the infected bug or flea.

"In crushed infected bugs the plague bacillus preserved its morphological characteristics during all the time it was found in the bodies of bugs. In the midst of a great mass of well preserved blood corpuscles could be seen an enormous quantity of plague bacilli in almost pure culture. The inner surface of the hind leg in six guinea-pigs was scratched three times with a fine needle and the crushed bug was rubbed over the scarification; all of the six pigs died of plague in forty-seven to sixty-nine hours. Pure cultures of plague bacilli were obtained from the following sources: (1) The crushed infected bugs on bits of linen—(*a*) dried

thirty-five days at room temperature, (*b*) 130 days in damp environment at 4 to 5° C., (*c*) exposed during eight days to direct sunlight, and (*d*) frozen ten days at – 5° C. to – 18° C.; and (2) from the fæces of bugs which had been allowed to dry on linen at room temperature for ten days. These were all verified by the inoculation of guinea pigs. From the results we must conclude that clothing and bedclothes which are soiled with material from infected insects, obtained either by crushing them or from their fæces, can serve during a long time as a source of infection. The clothing of people who live in dirty, unhygienic surroundings is generally covered with spots from crushed bugs and their fæces. Formalin vapour is a poor insecticide, especially for bugs."

Manning then gives a very good description of the bedbug taken from the *Bulletin* of the U.S. Entomological Bureau, and advocates measures for the destruction of these pests. He further considers it probable that the bug may play a part in the spread of infantile paralysis. Whether it does so or not, there is not the slightest doubt that the poor generally should be more carefully instructed in the destruction of bugs, lice, and other filth-loving parasites.

Obscure forms of fever in North China.—Fox, in the *Journal of the Royal Army Medical Corps* for August, 1912, reports some obscure forms of fever which he met with in North China. The disease is well known amongst the civil population, and is spoken of as " ten-day fever," but the actual cause of the fever has never been discovered.

The disease is characterized by the following signs and symptoms, the first five being invariably present in all cases: (1) Fever of a remittent type; (2) frontal headache, lasting from two to three days; (3) constipation; (4) furred tongue; (5) slow pulse (comparatively speaking). In addition, a few of the cases complain of abdominal discomfort, amounting in some cases to pain; others have complained of pain in the back, chiefly in the lumbar region, but the two last symptoms only occurred in a minority of cases. One of the most remarkable characteristics in the course of the disease is the small amount of disturbance in the general health of the patient. After the first two or three days of the fever, and almost invariably after the disappearance of the initial headache, the patient usually asks to be allowed up and given extra food, though at the time the thermometer may record a temperature several degrees above normal. The fever generally continues for ten to fourteen days. Relapses are rare, and second attacks do not occur in the same individual. The onset of the disease is usually sudden.

No fatal cases have ever been met with.

The cases have occurred at all seasons of the year, even during periods of severe cold, but they have most commonly been seen during the months of August, September, October and November, during and after the rainy season, and also at a period when flies were most troublesome. No malarial parasites were found in any of the cases, and quinine internally had no effect whatever on the course of the disease. Sandfly fever was excluded, both by the course and symptoms of the disease, as well as by the absence of the causative agent.

The Etiology of Beri-beri.—Chamberlain, Vedder and Williams communicate a third contribution to the etiology of beri-beri in the *Philippine Journal of Science* for February, 1912 (vol. vii, Sec. B., No. 1). They conclude that their experiments all substantiate the theory that polyneuritis gallinarum and beri-beri are caused by the deficiency of some as yet unknown substance in the food, this substance not being phosphorus. The theory that the disease is caused by an acid intoxication, due to the fermentation of rice by various saprophytic bacteria contained in the kernel, is untenable. They add the following to the list of substances which are of no importance in preventing neuritis of fowls: Nitrogenous compounds such as arginin, histidin, asparagin, and various amino-acids; lipoids of the lecithin group, and cholin; extract of onions. They further state that the neuritis-preventing principle is insoluble in ether, that it is absorbed by animal charcoal, and that the filtrate through the charcoal will not prevent neuritis.

After absorption the active principle cannot be removed from the charcoal by maceration with water, absolute alcohol, or ether. The administration of large quantities of sodium chloride failed to produce œdema in fowls suffering from polyneuritis. Five cubic centimetres of the author's extract (equivalent to 5 grm. of rice polishings) are sufficient to protect fowls subsisting upon polished rice. Two and a half cubic centimetres (equivalent to 2.5 grm. of polishings) are insufficient to confer complete protection against polyneuritis.

Dermal Leishmaniasis from South America.—Wenyon, in the *Journal of the London School of Tropical Medicine*, vol. i, Part 3, July, 1912, describes a very interesting case of dermal leishmaniasis in an Englishman who had travelled through Peru and Bolivia, from Lake Titicaca to the Tambopata River, and thence to its junction with the Rio Madre de Dios. The first indication of a sore appeared at the beginning of January, 1912, six months or so after having entered the country and on the way home to England it increased greatly in size, while another one appeared. In character the sores presented no difference from those which Dr. Wenyon himself had seen in Bagdad and other parts of Asiatic Turkey, though in the present case there was a marked involvement of the lymphatic system, this not having been noticed in the Bagdad ones. Dr. Wenyon cannot yet say whether the present case is one of espundia or not, but if so the two sores would have to be regarded as primary lesions—the " chancre espun-

dique" of Escomel. Cultures of the case were easily obtained on the well-known N.N.N. medium, and flagellate forms were seen first on about the tenth day. The cultures increased in richness and by sub-cultures—now at the ninth generation—the culture has been maintained for over two months. The sores were treated in two ways: (1) by the application of methylene blue, and (2) by subcutaneous injections of the patient's own killed cultures (Row's method). The small sore commenced to heal after this, and a month later it had practically covered over with skin. A dog and a small baboon were inoculated with material obtained from the sores. The dog developed a sore two months afterwards, the baboon small papules four months afterwards.

Cultivation of Spirochætes.—In the *Journal of Experimental Medicine* for August 1, 1912, vol. xvi, No. 2, Noguchi states that he has cultivated in a pure condition the following spirochætes: *S. Duttoni*, *S. Kochii*, *S. Obermeieri* and *S. Novyi*. He describes his method, and says that *in vitro* these strains reach their maximum growth after seven, eight, or nine days at 37° C. For their multiplication they require the presence of a piece of fresh sterile tissue and a body fluid capable of forming a loose fibrin with the tissue. The presence of some oxygen seems indispensable for their growth, since they fail to grow in an atmosphere of hydrogen or *in vacuo*. No growth was obtained at room temperature.

From cultures that show a good growth subcultures can be made, and the growth can be kept up in this way for many passages.

The pathogenicity of these organisms is not lost by cultivation, although there is a tendency for the virulence to become attenuated after growth *in vitro* has continued for a long time.

Longitudinal division has been observed and was followed under the dark-field microscope in fresh preparations from cultures. It occurs in all the species irrespective of the length of the organism. Transverse division seems also to occur, but Noguchi has not yet observed the entire process.

Lung Lesions in Leprosy.—Wise, in the *Journal of the London School of Tropical Medicine*, July 1912, vol. i, Part 3, writes on the lesions found in the lungs in leprosy.

He quotes a summary by Babes on the subject which shows that these may be of a varied nature, and then goes on to describe two cases he met with himself.

In the first case there were no gross pathological lesions in the lungs, but microscopical sections of some petechial spots which were present showed a diffuse small round-celled infiltration with occasional giant cells. There was no fibrosis, but a slight catarrhal cellular exfoliation existed in the surrounding alveoli. Numerous leprosy bacilli were present, apparently all intracellular.

In the second case the lungs microscopically showed small areas of bronchial consolidation, many pinhead nodules of a whitish, solid, semi-transparent character being scattered throughout the substance of both lungs. Microscopically these areas consisted of necrotic tissue surrounded by a small, round-celled infiltration in which an occasional giant cell could be seen. Lepra bacilli were also demonstrable. Many smaller petechial areas containing lepra bacilli were also present, but invisible to the naked eye.

Both cases were at the time of death in an advanced stage of the disease, and Wise thinks it possible that the lesions in the lungs, which were of a comparatively recent character, partook more of a final general dissemination than of a natural sequence of leprosy.

A New Treponema.—Noguchi, in the *Journal of Experimental Medicine* for August, 1, 1912, vol. xvi, No. 2, describes a new species of mucin producing spirochæte which he found in the mouths of individuals suffering from pyrrhœa alveolaris. He proposes the name *Treponema mucosum* for the species. Morphologically, the parasite is with difficulty separated from the *pallidum* and *microdentium*, but through its biological properties and animal reactions it can easily be differentiated from all the rest of the spirochæte. The parasite is not parasitic in the strict sense of the term, but exerts a certain pyogenous action when the tissue has been so injured by foreign substances as to enable it to survive. The strong fœtid odour in the discharge from pyrrhœa alveolaris is due, at least in part, to the presence of the organism in the affected tissue.

Dysenteric Types of Malaria.—Brem follows up his studies of malaria in Panama (*Archives of Internal Medicine*, vol. 9, No. 6, June 15, 1912), and deals in the present paper with the "Relation of malaria to other diseases with especial reference to dysentery." The work was undertaken with the idea of examining data bearing on the so-called dysenteric type of pernicious malarial fever. After an examination of many cases Brem concludes that the so-called choleraic and dysenteric types of pernicious malarial fever do not occur in Panama. In a study of 4,691 malarial infections he found that the number of cases complicated by acute dysentery, amœbic dysentery, typhoid fever, pneumonia, pulmonary tuberculosis and chronic nephritis was in each instance 1 per cent. or less, and further, that malarial infection appeared to bear no etiological relationship to any of them. Though this was so, nevertheless all the above diseases were complicated by a considerable percentage of malarial infections, the order of frequency being amœbic dysentery, acute dysentery, chronic nephritis, typhoid fever, pulmonary tuberculosis and pneumonia. Brem believes that the coincident occurrence of malaria with nephritis and tuberculosis is probably due to chance, while the synchronous occurrence of malaria with acute dysentery, amœbic dysentery, typhoid fever and pneumonia is chiefly

due to a lighting up of latent malaria by the other diseases. He thinks that the two forms of dysentery have about equal power to determine an exacerbation of latent malaria, the influence of typhoid and pneumonia being only about one-third or one-fourth as great.

The Treatment of Actinomycosis by Vaccines.—Kinnicutt and Mixter, in the *Boston Medical and Surgical Journal* for July 18, 1912, describe some cases of actinomycosis which they treated by vaccines made from pure cultures of the organism causing the disease. To make such a vaccine pure cultures were obtained by washing granules from the pus in five or six changes of sterile normal salt solution, and then sowing them in melted glucose agar at 45° C. Secondary contaminations are difficult to avoid, but as the authors found that stock vaccines are as effective as autogenous ones, the former may, therefore, be used.

The routine method of treatment is to give 0.1 c.c. of the "vaccine" subcutaneously for the first dose. This is repeated every three or four days, increasing the amount given 0.05 to 0.1 c.c. each time until a dosage of 0.75 c.c. has been reached. A greater amount than this was given in one case, when the dosage was raised up to 4 c.c., but with no evident benefit, although the constitutional symptoms were quite severe. Of course, as in all abscesses, if there are any collections of pus, incisions should be made and drainage established.

The authors have treated or had treated with "vaccines" eight cases of actinomycosis, two with abdominal, two with pulmonary, and four with cervico-facial manifestations. The thoracic cases were all advanced when first seen, both showing actinomycotic lesions of the chest wall, and one of them a large indurated area containing pus pockets over one side of the neck. Both of these cases grew rapidly worse and died. A very interesting result of the use of the vaccine was the immediate large increase of actinomycotic granules in the sputum. This effect lasted several days.

Of the two abdominal cases, one, after operation and drainage of a large abscess in the left inguinal region, followed by treatment with "vaccine" for two months, has apparently made a complete recovery. The other case was operated upon later for appendicitis, and an abscess containing actinomycotic granules was found. Since then the patient had been given autogenous actinomyces "vaccine" off and on for three months, when she died following involvement of the lungs. There were periods of apparent improvement, but the results, on the whole, were not striking, except for the fact that the general reaction was very marked with large doses, and that the patient, before vaccine treatment was begun, was growing worse so rapidly, and the process spreading so fast, that a fatal termination seemed certain in a short time. There was marked improvement at first under vaccine treatment, although at the same time the use of iodides and copper sulphate was stopped.

Of the four cases of actinomycosis of the jaw and neck, three have apparently completly recovered, and one is rapidly improving. The improvement in one of these cases was particularly striking. When admitted to hospital he had been suffering from actinomycosis of the jaw for over six months, had been treated thoroughly with iodide of potash, and had had numerous small abscesses which had formed, opened and curetted; but in spite of this, the induration had extended down his neck below the clavicle and a short distance beyond the median line to the other side. He was given actinomyces vaccine subcutaneously, and all other treatment omitted. A few days after the first injection, two small fluctuating areas appeared in the neck, which were opened and found to contain pus loaded with actinomyces granules, and no other micro-organisms. After this the lesion rapidly softened and diminished in size, and at the end of a month and a half all induration had disappeared. He was given vaccine every three or four days for about three months, and at the present time, a little over a year after treatment was begun, he is perfectly well, and shows no evidence of the disease except for two small scars, the remains of incisions made in opening abscesses.

In cases of actinomycosis of the jaw, the starting point is usually a bad tooth, so, of course, the offending tooth should be removed. The authors think that it is impossible to draw any general conclusions from these few cases, but it seems to them that the use of vaccines in superficial actinomycosis does do good. In lung actinomycosis, with the severe secondary infection which invariably accompanies it, vaccines are apparently useless.

Typhus Fever in the Philippine Islands.—Musgrave and Stanley, in the *Bulletin of the Manila Medical Society*, June, 1912 (vol. iv, No. 6), state that recent investigations have shown that typhus fever is a much more important factor in modern pathology than has been generally recognized. The disease is known to occur sporadically and occasionally in epidemic form in Korea, China, Cochin China, and other oriental countries, but previously had not been recorded in the Philippine Islands. The authors now demonstrate, however, that it is prevalent in this latter area, and quote a number of cases to prove it. Clinically, some of these were not absolutely typical of typhus fever, but they were still further removed in clinical manifestations from any of the other known fevers. They draw attention to Brill's work, and show how, by again calling attention to this important epidemic disease, he has created a notable service to mankind. The authors further state that, beyond the mere statement that typhus fever exists in various places in the Orient, there is but little in recent literature which can be used as of value in the diagnosis, and in locating the geographic distribution of this disease. Personal reports exist showing its sporadic occurrence in various places in China, Indo-China, Formosa, probably Japan, and in other Far Eastern and Oriental countries, and the significant fact stands out that practically all modern writers agree that the clinical picture of the disease is less severe.

and its supposed contagiousness is less than was formerly considered to be true.

Two other diseases which very closely resemble typhus, but which probably are different in their etiology, are the Rocky Mountain spotted fever of the Bitter Root Valley in Montana, and the tsutsugamushi disease of Japan. The work of the late Howard Ricketts shows conclusively that Rocky Mountain spotted fever is an entity distinguishable from that of typhus fever, and the work of the same author and his co-workers in Mexico proves the identity of tarbardillo or Mexican typhus with that of the older described disease, exanthematous typhus.

The recent exhaustive work of Wilder into the etiology and methods of transmission of typhus has positively incriminated the body louse (*Pediculus vestimenti*) and casts suspicion upon the bedbug and certain ticks, as being the transmitting agents of the infection, and, furthermore, that the infection is transmitted congenitally through the eggs of one generation of insects to another. Satisfactory experimental animals have been found in monkeys of the species of *Macacus rhesus*.

Failure to take advantage of modern experimental methods in positively determining the diagnosis of our cases, the authors state, has been due to the fact that the diagnosis of typhus was not seriously considered until the patients under discussion were well on the road to convalescence. However, the clinical pictures are in such close harmony with that described for typhus, that they are of the opinion that more careful work, which will be performed as soon as opportunity permits, will show that typhus fever occurs sporadically in the Philippine Islands, and that it is one of the infectious diseases which must be added to the nosology of tropical medicine.

Emetine in the Treatment of Amœbic Disease.—Rogers publishes another paper on "Further Experience of the Specific Curative Action in Amœbic Disease of Hypodermic Injections of Soluble Salts of Emetine" in the *British Medical Journal* of August 24, 1912. Since his first communication he has collected a further series of cases, and the results seem equally good to those first described. Different classes or varieties of amœbic disease were treated, such as: (1) Acute amœbic dysentery, with marked thickening and tenderness of the bowel; (2) moderately acute amœbic dysentery; (3) chronic amœbic dysentery; (4) acute hepatitis threatening liver abscess, and (5) amœbic abscesses of the liver. In a case of acute dysentery that died, but who had had several large doses of emetine before doing so, no amœbæ could be detected, after prolonged search, in the ulcers of the large bowel, and this must mean that they had all been killed by the drug. The toxicity of emetine to amœbæ *in vitro* has already been commented upon by workers in the Philippines, and this confirmation *in vivo* is very striking and important. The results of treatment in the other cases were phenomenal, and that even in patients where abscess formation had occurred. Rogers has used either the hydrochloride or the hydrobromide of emetine subcutaneously at first in ⅓ gr. doses, but latterly in ½ gr. doses. In two cases he gave 1 gr. at a time without any vomiting or depression as a result. The salts can be safely boiled for a very short time, but it is better to dissolve them in sterile saline, or to boil the solution first and then add the emetine salt. He has arranged with Messrs. Burroughs Wellcome and Co. to put up the drugs as "tabloids" and in sealed ampoules. Half a grain may be taken as the ordinary dose.

Such a dose does not produce vomiting or depression, and so may be given to patients *in extremis* or very seriously ill. This is a very great advantage, and there is no doubt that the treatment of amœbiasis by this emetine method devised by Rogers has a very great future before it.

Personal Notes.

INDIA OFFICE.

From July 16 to August 12.

Arrivals Reported in London.—Lieutenant-Colonel E. R. W. C. Carroll, I.M.S., B.; Captain N. N. G. C. McVean, I.M.S., B.; Major G. Bidie, I.M.S.; Major W. G. Richards, I.M.S.; Captain S. A. Ruzzak, I.M.S.; Captain W. A. Mearns, I.M.S.; Lieutenant-Colonel C. Duer, I.M.S., B.; Capt. R. H. Lee, I.M.S., B.; Captain F. C. Fraser, I.M.S.; Major W. G. Liston, I.M.S.; Captain H. H. G. Knapp, I.M.S.; Captain S. Haughton, I.M.S.; Captain J. Smalley, I.M.S.; Captain T. H. Stewart, I.M.S.

EXTENSIONS OF LEAVE.

Captain J. W. Burnett, I.M.S., 10 days; Lieutenant-Colonel P. C. H. Strickland, I.M.S., 4 m.

PERMITTED TO RETURN.

Captain W. Lapsley, I.M.S., B.; Lieutenant A. MacD. Dick, I.M.S.; Captain R. B. Lloyd, I.M.S.; Lieutenant-Colonel C. Mactaggart, I.M.S., *C.I.E.*; Major C. B. Prall, I.M.S.

LIST OF INDIAN CIVIL OFFICERS ON LEAVE (INCLUDING MILITARY OFFICERS UNDER CIVIL RULES).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Barnado, Captain F. A. F., I.M.S.
Carroll, Lieutenant-Colonel E. R. W. C., I.M.S. E. B. & A.
Christophers, Major S. R., I.M.S., 15 m., May 1, 1912.
Duer, Lieutenant-Colonel C., I.M.S., Home Dept., India, 6 m., May 1, 1912.
Lee, Captain R. H., I.M.S., B., 18 m., June 5, 1912.
Liston Major W. G., I.M.S., Bo.
Maynard, Lieutenant-Colonel F. P., I.M.S., B., 9 m., March 1, 1912.
McVean, Captain N. N. G. C., I.M.S., Foreign.

LIST OF INDIAN MILITARY OFFICERS ON LEAVE.

Showing the Name, Regiment, or Department, and the Period for which the Leave was granted.

Barnett, Captain J. W., I.M.S.
Bidie, Major G., I.M.S.
Fraser, Captain F. C., I.M.S.
Grant, Colonel D. St. J. D., I.M.S., to October 9, 1912.
Knapp, Captain H. H. G., I.M.S.
Malcolmson, Captain G. S., I.M.S., 18 m., from May 6, 1912.
McVean, Capt. N. N. G. C., I.M.S.
Mearns, Captain W. A., I.M.S., 12 m., from June 20, 1912.
Richards, Major W. G., I.M.S.
Ruzzak, Captain S. A., I.M.S.
Simpson, Captain W. J., I.M.S., 8 m., from March 12, 1910.
Smalley, Captain J., I.M.S.
Strickland, Lieutenant-Colonel P. C. H., I.M.S., 16 m., October 7, 1911.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"Annals of Tropical Medicine and Parasitology," July 31, 1912, Series T.M., vol. vi, No. 2.

Glossina morsitans and the Human Trypanosome.—Kinghorn and Yorke report further on the transmission of human trypanosomes by *G. morsitans*. Their further work leads them to the following conclusions: (1) *Trypanosoma rhodesiense* is transmitted by *G. morsitans*. (2) *G. morsitans* transmits *T. rhodesiense* in nature. (3) A considerable percentage of the local game in Northern Rhodesia is infected with *T. rhodesiense*.

"British Medical Journal," August 24, 1912.

New Methods for Staining the Tubercle Bacillus—Macalister, Assistant Bacteriologist, Lister Institute, describes the use of antiformin in sputum examination, and also three new German methods for demonstrating tubercle bacilli. These are as follows:—

Much's Method (1907).—A modification of Gram's method. The fixed film is treated for a few minutes with hot carbol-methyl-violet solution (10 c.c. of hot saturated alcoholic solution of methyl-violet in 100 c.c. of 2 per cent. carbolic acid). The slide is washed, and treated with Lugol's iodine for one minute, 5 per cent. hydrochloric acid for one minute, 3 per cent. hydrochloric acid for ten seconds, and a mixture of acetone and absolute alcohol in equal parts to complete the decolorization. One per cent. neutral red may be used as a counterstain.

Herman's Method (1908).—The stain, a 3 per cent. solution of crystal violet in 95 per cent. alcohol, and the mordant, 1 per cent. ammonium carbonate solution, are kept in separate bottles, and mixed for use in the porportion of 1 to 3. The fixed film is stained with this mixture over a small flame for a few minutes. The slide is washed, transferred to 10 per cent. nitric acid, and then to absolute alcohol. Herman does not use a counterstain, but in the present investigation a 0·3 per cent. chrysoidin solution has been found of service.

Gasis's Method (1907).—Corrosive sublimate crystals amounting to the size of a pea are boiled in about 5 c.c. of a 1 per cent. eosin solution (eosin 1 grm., absolute alcohol 5 c.c., distilled water 95 c.c.). The hot stain is filtered on to the slide, and staining over the flame is allowed to proceed for two minutes. The slide is washed and then decolorized with alkaline potassium iodide solution (potassium iodide 1 grm., sodium hydrate 0.5 grm., 50 per cent. alcohol 100 c.c.) and with absolute alcohol. Acid methylene blue is used as a counterstain.

Macalister believes that Herman's method is the only one of the three which can be compared with that of Ziehl-Neelsen for ease, utility and efficiency. Böhm, in discussing the efficiency of different recent methods, says that the method of Gasis is interesting, but unreliable; he finds the Ziehl-Neelsen method superior to all others.

"British Medical Journal, August 24, 1912.

The Picrin Method of Staining Tubercle Bacilli.—Wilson describes Spengler's method for staining tubercle bacilli with picric acid. Suitable films are stained as follows: (1) Stain with carbol fuchsin, warm, but without too much heat; (2) pour off the stain without washing; (3) pour on picric acid alcohol (consisting of equal parts of saturated solution of picric acid and absolute alcohol); after three seconds (4) wash with 60 per cent. alcohol; (5) treat with 15 per cent. nitric acid till yellow (thirty seconds); (6) wash again with 60 per cent. alcohol; (7) counterstain with picric acid alcohol till lemon-coloured; (8) wash with distilled water and dry gently at a low heat.

Wilson believes that the method is the best for the demonstration of bacilli in the urine, but, like the procedures described above, it is doubtful whether it will supersede Ziehl-Neelsen's method.

"Archiv für Schiffs- und Tropen-Hygiene," Bd. 16, Zweites Augustheft, 1912. Heft 16.

Filariasis in the South Sea Islands.—Tülleborn writes on the periodicity of the filariæ found in some of the Pacific Islands. The examination of some Samoan natives in Hamburg showed that the embryonic filariæ found in these people have no periodicity, about equal numbers being found in the blood by day and by night. On the other hand, during a journey in the South Seas Tülleborn found that the filariæ of the Bismarck Archipelago and German New Guinea have a well-marked nocturnal periodicity, the same holding good in Amoiba and Celebes. In Fiji, as Lynch, Brunmin, Bahr, and others have pointed out, the non-periodic variety is again met with. A complete mapping out of the periodicity of the filariæ in the different groups of islands in the Southern Pacific would be of great interest, and might help materially in the solution of the matter.

"The Archives of Internal Medicine," August 15, 1912.

Pellagra.—The above number of the *Archives* contains a condensed report of the Illinois Pellagra Commission. Amongst other interesting points the report states that it is striking that the great majority of the cases on which they have definite information have arisen in persons living and working in the two largest cities in the State, Chicago and Peoria. This, investigators will note, is contrary to general experience in Italy and elsewhere, and much of Sambon's theory of the disease being carried by *Simulia* is based on this fact. The Commissioners, however, state that one species of Simulium, *S. venestum*, does enter towns.

"Isthmian Canal Commission Reports," June, 1912.

Health of the Canal Zone.—Gorgas, in his monthly report of the Department of Sanitation for the month of June, 1912, states that the average death-rate amongst the employees for that month was 6.84 The average rate for the cities of Panama, Colon, and the Canal Zone combined was 22.88. The death-rate amongst the employees is thus seen to have been a very low one. The principal causes of death were: Amœbic abscess of liver, dysentery, blackwater fever, malaria, pneumonia, and tuberculosis. No cases of yellow fever, small-pox, or plague originated on or were brought to the Isthmus during the month.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

BLACKWATER FEVER IN BURMA.

By LAWRENCE G. FINK, M.B., C.M.

(Being an addition to the cases published in the JOURNAL OF TROPICAL MEDICINE AND HYGIENE, September 15, 1911.)

CASE 7.—Ghurka sepoy, age 28 years, was admitted on December 21, 1909, for fever; temperature 103.8° F., anæmic, spleen enlarged, 2½ in. below costal arch, urine high coloured, but no albumen. Previous history of malarial attacks, but he had prophylactic doses of quinine up to within a week prior to admission. Two days after admission jaundice set in, and there was persistent vomiting. He was given Hearsey's mixture. On December 29, 1909 (eight days after admission), he was given quinine sulphate and magnesium sulphate in mixture. The same evening the temperature went up to 104.2°, and the urine was reduced to 10 oz., was very red and deposited albumen. He was now again put on Hearsey's mixture and received an occasional injection of quinine hydrochloride. On January 10, 1910, he was given 10 gr. of quinine by the mouth, and hæmoglobinuria and jaundice again occurred. The liver and spleen became very tender.

The occurrence of hæmoglobinuria after the oral administration and not after the injection of quinine is interesting. The sulphate was used in the former and the bihydrochloride in the latter.

CASE 8.—Mahomedan sepoy, age 30 years, arrived at Myitkyina in November, 1909, and from this time to end of December, 1909, had 10 gr. doses of quinine on two successive days each week. He had a history of many previous attacks of malaria. Last dose of quinine was in December, 1909. Admitted to hospital on June 2, 1910, suffering from fever and enlarged spleen. He was given injections of quinine on June 3, 4, and 5. On June 6 urine was the colour of port wine. Hearsey's mixture was now given. The hæmoglobinuria lasted three days, but the patient died on June 10.

This case offers marked contrast to what happened in Case 7. It is difficult to say, however, to what extent, if any, the quinine was responsible for the onset of hæmoglobinuria in this case. Dr. Pirie has recently reported in the JOURNAL OF TROPICAL MEDICINE AND HYGIENE, July 1, 1911, pp. 194-6, four similar cases in which the administration of quinine appears to have precipitated attacks of blackwater fever. Dr. James Rooth, Brighton, has also reported, in the *British Medical Journal*, June 24, 1911, the case of a European from Burma, who, on arrival in England, took a dose of quinine, 6 gr., and in 2½ hours passed a pint of dark-coloured urine. This case ended fatally on the third evening, the urine having cleared up the same morning. In the *Lancet*, May 14, 1910, Dr. D. G. Marshall has reported a case of hæmoglobinuria, which occurred within a few hours after taking a large dose of quinine. This patient had recently been in the West Coast of Africa, and the blackwater fever occurred in Edinburgh. Dr. Marshall and Dr. Hartford (who has also commented on this case) (*Brit. Med. Journ.*, May 28, 1910), have drawn attention to the fact that patients returning home from malarious countries should continue taking regular prophylactic doses of quinine for some months and avoid chills. These writers have no doubt that the disease is malarial in origin, and hence strongly recommend the quinine prophylaxis of the disease in small doses, 5 gr. daily. Craig, on the other hand, says, in the January, 1911, issue of the *Archives of Internal Medicine* (quoted in *Therapeutic Gazette*, May, 1911, pp. 325-5), that blackwater fever is practically never due to malarial infection, and also practically never due to the administration of quinine for the cure of malarial infection. In the light of the cases above referred to, it is difficult to agree with Craig. This matter has been dealt with by me in an article that has recently been sent for publication to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE and will, therefore, not be discussed further (*Journal of Tropical Medicine and Hygiene*, September 15, 1911, pp. 276-80).

CASE 9.—Ghurka sepoy, age 30, was admitted to hospital in February, 1910, suffering from blackwater fever. He had a previous history of three attacks of malarial fever. He is said to have received, as a prophylactic, 10 gr. of quinine sulphate on each of two successive days during the previous seven months. Two hours before the onset of hæmoglobinuria he had had his last dose of 10 gr. This case ended fatally.

CASE 10.—Ghurka child, age 8 years, had a history of previous malarial attacks and very irregular prophylactic doses of quinine. The hæmoglobinuria occurred twice in April, 1911, two hours after taking a dose of quinine. The case was mild, and the patient recovered on Hearsey's treatment. This is one of the two cases in children that have been reported to me since this paper was commenced. In the other case, which occurred in Katha, a European lad, 8 years of age, no quinine had been taken for some days prior to the attack. There was a history of exposure to wet.

CASE 11.—European, Burma Gold Dredging Co., Myitkyina District, age 26, gave a history of two previous attacks of blackwater fever in South Africa, and stated that he had been getting fever off and on since coming to this district (Myitkyina). He had been taking quinine sulphate, which he stated had invariably produced, even in a small dose, a reddish-brown colour of urine. He accordingly changed to euquinine, but this had the same effect. At about 3 p.m. on December 13, 1909, he had a severe attack of ague, with very high temperature and intense jaundice. He had taken 10 gr. of euquinine when he felt the attack coming on. The urine was copious, very dark, and almost of a syrupy consistence. The patient passed dark

bloody fæces, became comatose, and died that same evening. This case emphasizes the fact that a patient with a previous history of the disease and very susceptible to quinine is not fit for work in any very malarial part of the tropics. The dark fæces probably contained a large quantity of hæmoglobin. Dr. Simpson has recently pointed out that the vast bulk of the hæmoglobin escapes in the fæces, and when this is excessive the overflow passes out in the urine.

Case 12.—Ghurka sepoy, age 30 years, was admitted for fever on June 20, 1910. He had a previous history of many attacks of malarial fever. He was injected on 16th, 18th, and 20th. After the last injection the urine became hæmoglobinuric and continued dark in colour till 23rd (four days). The temperature, however, fell to normal on the 21st, and there was no rise during the remaining days on which hæmoglobin was excreted by the kidneys. This case is interesting as pointing to the fact that the excretion of hæmoglobin is probably not the cause of the temperature usually met with in cases of blackwater fever during the stage of excretion. The patient recovered.

Case 13.—Ghurka sepoy, age 21 years, was admitted on August 27, 1910, suffering from high fever, very jaundiced, and passing very dark red urine containing much albumen. He gave a history of fever for the previous ten days. He is said to have had 10 gr. of quinine on two successive days each week and since June and up to the week previous to his attack. Spleen enlarged 1½ in. below costal arch. The hæmoglobinuria, which gradually decreased, lasted ten days. This case shows irregular temperature during hæmoglobinuria and the pulse-rate was slow, unlike what occurs in a pure malarial attack. It also shows a post-hæmoglobinuric fever.

Case 14.—Ghurka sepoy, age 19 years, last had quinine in December, 1909, was admitted on February 13, 1910, with a temperature of 104.2° F. He was treated for malaria. His temperature fell to normal the next day, and there was no further rise till the ninth day, when the urine became hæmoglobinuric. The temperature fell to normal on the tenth morning, and there was no further rise, but the hæmoglobinuria continued till the fifteenth day of illness. This case illustrates the fact that there may be a total absence of fever during the hæmoglobinuric stage. The patient recovered.

The following case has been furnished by the gentleman who suffered, and the notes were made by his medical attendant, an I.M.S. officer.

Case 15.—European, ten years' service in Burma, felt out of sorts on June 26, 1903, and took a quinine pill of 5 gr. at 4 p.m. About an hour or an hour and a half later he had a severe rigor accompanied with uncontrollable vomiting and excruciating pain over the lumbar region. The temperature ran up to 104° F., and the urine passed was as black as ink. The urine cleared up by about 10 o'clock the same night. Next morning he was free from fever, but his urine was still darker than natural. It remained rather dark for two or three days. Again, on July 26, 1903, in the same jungle he had a very similar attack. A small dose of quinine was followed two hours later with a severe rigor, vomiting, black urine, and a temperature of 104° F. The fever lasted this time for two days. Again, on August 7, 1903, the same sequence occurred, preceded by 5 gr. of quinine, only this time the fever was more persistent and did not leave him, but as far as the urinary symptoms, &c., there was no change. On the third day he took some Warburg's tincture, which reduced the fever, but shortly afterwards he had the pains in the back and head, black urine, vomiting, &c. He then returned to headquarters and had what seems to have been a regular attack of ordinary tertian fever. He was then in the hands of a hospital assistant, who denies that he gave him any quinine, but the patient says that very shortly after he had taken something this medical subordinate had prescribed for him he had a severe recurrence of all his old symptoms. On August 13 he was seen by the civil surgeon for the first time. This officer found him suffering from marked tertian fever, and with every rise of temperature there was some darkening of the urine. Although it was not so severe and so marked as before, there would appear no reason to doubt but that he passed blood-colouring matter even when he was not taking any quinine whatever. He was also at this time slightly jaundiced and in a state of very extreme anæmia. The urine after standing presented the usual three layers as present in the urine of those suffering from blackwater fever. He states the water cleared each time the temperature fell to normal. His blood was not examined. On August 25 he was free from fever, but was very anæmic and debilitated. There were a few crescents and crescent-derived bodies in the blood, but no intercorpuscular bodies. There was a great deal of the usual malarial pigment free and in the white cells. The spleen was enlarged about two or three finger-breadths below the costal arch, but was not tender. He was put on an ordinary iron arsenic tonic mixture. On the evening of August 29 he had a rise of temperature up to 100° F. and voided urine about the colour of stout, sp.gr. 1012, slight trace of albumen, and full of hæmoglobin. With the patient's consent, on the 31st at 7.30 a.m., he was given one dose of quinine, 10 gr. At 10 o'clock he had a severe rigor and all the symptoms as before occurred. Between 10 a.m. and 5 p.m. he passed about 60 oz. urine. Up to 1 p.m. this was of the colour of ink, and from that hour on it gradually lightened. Temperature at 11 a.m. was 101° F., but it gradually rose up to 104° F. at 5 p.m. There was severe vomiting. By about 8 a.m. next day the urine was quite clear. The temperature rose that evening (September 1) to 103.5° F., but was normal next morning. His blood was examined every hour on August 31 and not a single malarial body was found. The white blood cells were very much reduced and showed a great tendency to break up easily under manipula-

tion. In the many slides examined there was hardly any malarial pigment seen. The patient then went home, and on arrival consulted a well-known specialist, who wrote as follows: "Mr. B. D. suffered from repeated attacks of blackwater fever during June, July, and August. The oncoming of the blackwater was apparently associated with a dose of quinine taken about two hours before the appearance of the fever. Since leaving Rangoon on September 3 he has had two malarial attacks. He has taken no quinine since August 29. He is at present very anæmic, his spleen is much enlarged, and his blood shows, on microscopic examination, two kinds of malaria parasites, the malignant and the benign tertian. His case requires very careful management, as a large dose of quinine, cold, fatigue, or the neglect of quinine altogether, might bring on a grave attack of blackwater fever. I am distinctly of opinion that he is unfit for jungle life in a malarial country."

This is a very interesting case, and has hence been reported in detail. Mr. D. has sent me all the prescriptions given to him at home. There is one in which 2 gr. doses of methylene-blue twice daily was prescribed, and this, Mr. D. says, cured him. When quinine cannot be tolerated, as in this case, methylene-blue should certainly be tried. Mr. D. has had no relapse and is still in Burma, but is probably not so much now exposed to malaria.

(6) Summary of Cases Collected.

When this paper was commenced I knew of only fourteen cases, but this number has now been more than trebled, as will be seen from the tabular statement below. For the additional information I am indebted to several civil surgeons who, at the request of Colonel Carruthers, Inspector-General of Civil Hospitals, Burma, have kindly given me every assistance. I have also received help from the Managers of the Bombay Burma Trading Corporation, Messrs. Steel Brothers, Messrs. MacGregor and Co., and Messrs. Foucar and Co., who have several European employees on forest duty.

Tabular Statement of Verified Cases.

	District	Europeans	Anglo-Indians	Indian	Chinese	Burmese	Total
Lower Burma, 3	Myitkyina	2	—	17	1	—	20
	Katha	3	—	2	1	1	7
	Ruby Mines	3	—	—	—	—	3
	Upper Churdwin	3	—	—	—	—	3
	Magwe	2	—	—	—	—	2
	Shwebo	1	—	—	—	—	1
	Pakokku	1	—	—	—	—	1
	Yemethin	—	—	1	—	—	1
	Bhamo	2	—	—	—	—	2
	Rangoon	1	—	—	—	—	1
	Akyab	—	—	1	—	—	1
	Sandoway	—	1	—	—	—	1
	Lancet case (district not known)	1	—	—	—	—	1
	Total	19	1	21	2	1	44

Remarks.

All adult males, except two male children (one European and one Indian). No females.

Fifteen cases in Myitkyina District in last two years (July, 1909, to July, 1911); two Europeans, 12 Indians, one Chinese.

Eight European cases in last ten years amongst European employees of the Bombay Burma Trading Corporation, as follows:—

1900	J. S. L.	Rangoon	B.W. fever at home	Recovered
1903	E. F. D.	Toungdwingyi	*Vide* Case No. 15	Recovered
1903	L. V. B.	Kindat	,, ,,	Recovered
1905	R. A. O.	Gangaw	,, ,,	Died
1907	J. H. B.	Mingin	,, ,,	Recovered
1908	F. S. H.	Mansi	,, ,,	Died
1910	R. G. M.	Mu ...	... ...	Died
1911	R.w.d.w.	Mingin	B.W. fever at home	Died

(*Vide British Medical Journal*, June 24, 1911.)

Lancet case was an Indian civilian who contracted the disease at home (*vide Lancet*, June 18, 1910).

Suspicious cases and others heard of but not verified, not entered in table.

It is evident from these figures that blackwater fever occurs in several districts in Burma, and that Europeans, especially those on forest duty in very malarial districts and exposed to wet and chill, have suffered to an extent sufficient to justify the writing of this paper, in which I have attempted to draw special attention to a disease the etiology of which is still unsettled. The incidence of the disease in the Myitkyina District, fifteen cases within the last two years, is high enough to demand some special investigation, which I have no doubt will be made by the malaria experts who are now working in the Province.

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(22) *Lancet*, June 18, 1910, p. 1717.
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(24) *British Medical Journal*, June 24, 1911, pp. 1462-3.
(25) Journal of Tropical Medicine and Hygiene, July 1, 1911, pp. 194-6.
(26) *Therapeutic Gazette*, May, 1911, pp. 323-25.
(27) "Blackwater Fever," by Fink, Journal of Tropical Medicine and Hygiene, September 15, 1911, pp. 276-80.

COMMENTS UPON DR. LAWRENCE G. FINK'S ARTICLE ON BLACKWATER FEVER, OF SEPTEMBER 15, 1911.

By Dr. H. M. James.

Isthmian Canal Commission, Canal Zone, Ancon Hospital.

(Dr. James's letter is addressed to Dr. Fink.)

Sir,—I have read with much interest and profit your paper, "Blackwater Fever," in the Journal of Tropical Medicine and Hygiene, for September 15 of this year.

I am sending you in this mail a copy of a report on Hæmoglobinuric Fever in the Canal Zone, by Dr. W. E. Deeks and myself, which I hope will prove of interest to you. However much you may agree or disagree with the conclusions reached by the writers, if you will look through the case reports, you will find the records of the cases taken from notes on the charts, and many of these will, I think, confirm your opinions.

I am not able to find a copy of Dr. Avery's paper, referred to by you, and so cannot discuss his case. I have an original reprint of Dr. Craig's paper, which he sent me some time ago. Dr. Craig is an authority of repute on questions that have to do with malaria, but his observations on blackwater fever, of which he admits that he has seen but two cases, are decidedly erroneous, particularly his account of the geographical distribution of the disease. Especially is he in error as to the prevalence of malaria and blackwater fever in India as you note, and which fact I insisted on in the appendix to our report. He is equally in error as to the prevalence of these diseases in Italy, as Professor Marchiafava informed me in a personal communication recently received that Bignami and he have repeatedly observed the disease there. Craig has neglected, as many others have also done, to take into account the parts of the world where a very high endemic index of estivo-autumnal malaria prevails. Even in these places there will be no blackwater among natives, nor among aliens who are protected against malaria and treated promptly. Permit me to call your attention to this point as discussed in the report.

In my opinion, you are quite right in your statement that the malarial attack preceding the blackwater itself should be distinguished. Marchiafava and Bignami have defined blackwater fever as a syndrome that occurs in the course of a malarial infection, and I think they are correct in this definition. I have seen blackwater supervene after the patient had been three weeks in the hospital, and had had 30 gr. of quinine a day during that time. This might not be interpreted as "during the course of a malarial infection," but since such cases are very rare, it is probable that in them the quinine was not properly absorbed.

I do not agree with Marchiafava and Bignami when they state that quinine cures some cases of the disease. There is no proof that such cases would not have recovered without the use of quinine, and there is abundance of proof to show that a recovery will take place when quinine has not been given. As noted in the report, we are unable to classify the result of quinine administration in blackwater, otherwise than to say that in some instances blackwater undoubtedly followed the use of the drug, because the same phenomena were observed in untreated as in treated cases.

Dr. Ross's case, of which Dr. Thomson kindly sent me a reprint, is a manifestation of post-hæmoglobinuric fever. I have in preparation a study of this condition. Such cases are not due to a manifestation of clinical malaria, for a very careful study of autopsy slides has convinced me that the parasites and pigment as well disappear very rapidly when once hæmoglobinuria has set in. Even in cases admitted with heavy estivo-autumnal infections and complicated by blackwater and in which death occurs within forty-eight hours, the parasites are very few in number at autopsy and sometimes cannot be found. This is not so in cases of uncomplicated malaria admitted with very heavy infections and uncomplicated by blackwater, for these invariably show in this time an abundance of parasites at autopsy even when quinine has been administered very freely, both by mouth and hypodermically. The value of early and abundant administration of quinine as a prophylactic against the development of hæmoglobinuria in malarial cases very well shown in the report of Surgeon Zeigler, of the U.S. Navy, in his communication to Dr. Deeks and myself, and published in report. Taken with the evidence from other parts of the world, which we collected, there can be no doubt as to the efficacy of this method of treatment.

Your comparison of the relation of tabes to syphilis with that of blackwater to malaria is very interesting. At present blackwater is occurring in this hospital in about 1 per cent. of the cases admitted for malaria, and it is noteworthy that at the present time, when our hospital rate for all classes of patients with malaria is about 150 per thousand per annum, that blackwater is occurring only in those who have been severely affected by malaria, and not in newcomers.

I shall very much appreciate it if you will send me a copy of your paper on blackwater when published, and also one of that which appeared in the Journal of Tropical Medicine and Hygiene. Blackwater is a very grave disease, with a comparatively high death-rate, and one cannot get too much information on the subject.

We hear that the Berkefeld Filter Co., Ltd., of 121, Oxford Street, London, W., have received a large order for Filters for the Egyptian State Railways. This may be regarded as proof of the efficiency of these well known filters.

"The Indian Medical Gazette," August, 1912.

Guinea Worm Infection.—Chitale describes his observations on three hundred cases of guinea worm. It is not clear from his manuscript if he met with all these cases at Damoh, Cent. Prov., where he is the civil surgeon. He gives the usual treatment, and mentions as complications in neglected cases: (1) Extensive abscesses; (2) fistulæ and sloughing; and (3) stiffness and ankylosis of joints.

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THE JOURNAL OF

Tropical Medicine and Hygiene

OCTOBER 1, 1912.

SIR PATRICK MANSON TESTIMONIAL FUND.

THE contributions towards this fund have been numerous and generous, and the number increases almost daily. It is some time since the list was opened, but those interested in tropical disease are so widely scattered throughout the world that it takes time to reach them and to get replies. The contributors not only by their donations, but in many instances by their letters accompanying the donations, express their gratification that a testimonial had been initiated, and cordially wish it success.

The testimonial is in two forms, a National and an International, the former undertaken by a London Committee, and the latter initiated by Professor Blanchard, of Paris, working in co-operation with the London Committee.

The National testimonial has taken the form of a portrait which appeared in the Royal Academy exhibition in the summer of 1912. The artist, Mr. Young-Hunter, has given us a lifelike portrait of Sir Patrick. In connection with the National testimonial also, it is hoped to found a scholarship for the advancement of the study of tropical medicine in some one of its many branches, and we look forward to ample funds being forthcoming so that this worthy object may be attained. The International tribute to Sir Patrick Manson is in the form of a medallion of gold bearing an impression of Sir Patrick's features. M. Richer, of Paris, has produced an artistic medallion, replicas of which contributors will be pleased to possess.

The appeal for funds for this testimonial has been hitherto more or less of a semi-private nature, but now that the response has proved to be generous, it is intended to let the matter be more widely known. To medical men and others directly in touch with scientific work have circulars for the most part been sent, but they are but a mere fringe of the multitude who are beholden to Sir Patrick Manson for the work which he has done and the principles he has founded on which the whole fabric of tropical medicine is being built. There is no European living in the tropics but owes gratitude to Sir Patrick; there is no commercial undertaking in the tropics but is indebted to him for the improved health of its employees, both native and foreign, and the consequent improvement in its finance; science is his debtor, and all mankind has reaped benefits by the work which he inaugurated.

Seeing that now the public are made acquainted with what is being done in the matter of a testimonial, we look forward to a generous response to the fund which is being raised to further a suitable acknowledgment of all we owe to Sir Patrick Manson.

The Committee appointed to deal with the testimonial consists of:—

Staff-Surgeon Percy W. Bassett-Smith, R.N., D.T.M. and H., Cambs., Lecturer on Tropical Medicine, Royal Naval Hospital, Haslar; James Cantlie, Esq., F.R.C.S., Member of Honorary Surgical Staff and Lecturer, London School of Tropical Medicine; C. W. Daniels, Esq., M.B., M.R.C.P., Member of Honorary Medical Staff and Lecturer, London School of Tropical Medicine; Colonel Sir Wm. B. Leishman, R.A.M.C., F.R.S., M.B., C.M., Professor of Pathology, Royal Army Medical College; Professor G. H. F. Nuttall, F.R.S., M.D., Ph.D., Sc.D., Quick Professor of Biology, University of Cambridge; Wm. Thos. Prout, Esq., C.M.G., M.B., C.M., Hon. Lecturer, Liverpool School of Tropical Medicine; Major Ronald Ross, C.B., F.R.S., F.R.C.S., LL.D., D.Sc., Professor of Tropical Medicine, University of Liverpool, and Liverpool School of Tropical Medicine: Professor W. J. R. Simpson, C.M.G., M.D., F.R.C.P., D.P.H., Lecturer, London School of Tropical Medicine.

To any one of the above contributions may be forwarded, or to the Treasurer, James Cantlie, F.R.C.S., 140, Harley Street, London, W.

SENSITIZED VACCINES IN BACILLARY DYSENTERY.

IN the rapid additions to our knowledge of treatment by vaccines it is possible to forget the basis

of our knowledge concerning these valuable additions to our means of healing disease. Immunity is the object, and this may be attained by producing either an active or passive immunity. Active immunity, obtained by producing an antibody by vaccination with dead microbic cultures, usually lasts several months; whereas passive immunity, obtained by injecting the serum of an animal which has been actively immunized, confers protection for no more than a week or a fortnight. The actual immunity by the active method, however, does not afford protection immediately, nor for some time afterwards, during which period infection may supervene, and all the more readily because during the so-called "negative phase" the resistance to infection is actually lowered.

Recently Besredka, in order to avoid some of the drawbacks, such as serum sickness, anaphylaxis, or hyper-sensitiveness to horse serum, lessening the negative phase period, and the inconvenience resulting from introducing a large quantity of fluid beneath the skin, has introduced what he terms "sensitized vaccine." The process of preparation of the vaccine consists in first making an emulsion of the specific bacilli (enumerated) in a saline solution; this is brought in contact for twelve hours with serum from an immunized animal. Besredka states that the bacilli attract the specific antibody in the serum and precipitate. After pipetting off the serum, the bacilli with the antibodies attached are washed, so as to free them of all trace of serum, and then centrifugalized. Besredka, as a rule, kills the microbes by heat or by adding 0.5 per cent. phenol before using the vaccine.

It is well known that the treatment of bacillary dysentery by ordinary vaccine is somewhat dangerous, even when the organism is killed by heat, owing to the toxicity of the organism; moreover the negative phase lasts for almost a fortnight, and the immunity when obtained does not last more than six weeks at the most. Dopter has shown that by using Besredka's sensitized vaccines experimentally in mice the negative phase is practically done away with, immediate immunity conferred, and that the period of protection is increased to over four months.

THE SOLUBLE SALTS OF EMETINE IN AMŒBIC DYSENTERY.

Professor Leonard Rogers, by the injection of emetine in dysentery, has added a valuable method of treating amœbic dysentery to our armamentarium. The administration of ipecacuanha has ever proved a stumbling-block, owing to the difficulty of its retention by the stomach, and also from the fact that the patient, it may be in a very weak condition, is deprived of food for some four or five hours daily in order to lessen the tendency to vomiting. The hypodermic doses of the hydrochloride of emetine tried up to the present vary from 1/6 gr. to ½ gr.; this amount corresponds to from about 30 gr. to 60 gr. of ipecacuanha, and as the emetine when given hypodermically lessens or practically does away with the tendency to nausea, there need be no interruption in the administration of nourishment, a most important point in serious cases of dysentery in which the bodily strength is at a minimum. After the injection the temperature is found to speedily subside, and in cases of hepatitis associated with dysentery the pain diminishes. The injections may be given twice a day at first, repeated should relapses occur, and continued for some time at intervals as a precaution against relapse.

BRITISH MEDICAL ASSOCIATION IN SOUTH AFRICA.

In a leading article in *The Transvaal Medical Journal* for August, 1912, we find the following interesting account:—

"For some years past the more thoughtful members of our profession have realized the need for some form of union amongst the various Medical Societies in South Africa. At the Bloemfontein Congress in 1906 a proposal to form a South African Medical Association was brought forward; but the feeling of the majority of the delegates was that the formation of such an Association was not desirable, in view of the fact that so many branches of the British Medical Association were already in existence. The Medical Societies in the more northern Colonies were not, however, at that time, willing to become affiliated to the British Medical Association, but fortunately the objections to this step, which then existed, have now been removed; with the result that, as our readers are doubtless aware, the Transvaal Medical Society and the Pretoria Medical Society have recently merged their identity into that of the larger Association. We believe that the gain to these Societies and to the whole profession will be considerable. We are also pleased to have been able to record, in our issue of two months ago, the formation of a branch of this Association in Rhodesia.

"Until quite recently there was an opinion current amongst certain members of our profession, that the British Medical Association was a political organization, and its functions were, if not wholly, at least mainly political. This, of course, is a total misconception. The only qualification for membership required is that the applicant should be registered as a medical practitioner in Great Britain or one of her Colonies. Neither the possession of a British qualification nor naturalization is required in the case of foreigners. Membership of the Association, therefore, entails no restrictions which were not required by the original Societies.

"The opposition to affiliation, which previously existed in certain quarters, was due to the fact that matters of local interest or of internal discipline might be referred for settlement to the Central Council in England, and it was quite naturally felt that this Council, unacquainted with South African conditions, was not a suitable body to control the

profession out here. This source of objection was removed by the formation of a South African Committee as the governing body for South Africa, making the Association in South Africa autonomous. Thus, while we benefit by being affiliated to the largest medical society in the world, we at the same time govern ourselves in all local matters. All the branches are represented on the Central South African Committee in the proportion of one delegate for every fifty members. Where a branch is subdivided into two or more divisions—as is the case with the Transvaal Branch, with the Witwatersrand and Pretoria divisions—the total membership of both divisions is the membership of the branch.

"It is unnecessary to dilate on the advantages to the profession of all societies being united in one association. Each branch or division can, and does, carry on its clinical and scientific work just as well as any local society could do; their union, however, under one association provides machinery whereby matters affecting the welfare of the whole profession can be adequately discussed by representatives of every section, thus enabling the Central Committee to represent the considered views of the whole profession in this country. Clearly the more extensive our membership, the more influence and weight we shall have. It is no secret that in the past we have suffered from want of unanimity, and many misunderstandings have arisen owing to the absence of facilities for thorough discussion by all interested. Local societies, and unfortunately, not infrequently individuals, have approached the Government purporting to represent the profession, only to be followed by others equally badly authorized who have put forward different views, the inevitable result of such action being that we have over and over again been told by Ministers that until we, as a corporate body, have decided what we really want the Government are unable to assist us or to consider our proposals. That such a condition of affairs should have arisen is entirely our own fault, but the union of the Medical Societies which has recently taken place will go far to remedy it, and to discredit unauthorized and self-elected representatives.

"Naturally, those of us who reside in the larger towns have the greater responsibilities, but nevertheless the country practitioner is not exempt. We would, therefore, earnestly appeal to all those who are not members, whether resident in town or country, to make the small sacrifice necessary and thus strengthen the profession in South Africa, by joining the Association."

Epidermoidal Metaplasia in Ureter and Pelvis of Kidney.—Harald Seidelin, *Journal of Pathology and Bacteriology*, April, 1911, vol. xv, pp. 475-477, one plate. A case of cystopyelo-ureteritis ulcerativa with extensive epidermoidal metaplasia. No signs of tuberculosis or any other specific cause were found. The case was observed in Yucatán, Mexico. Various theories concerning the pathogenesis of this interesting phenomenon are discussed, but no definite position is taken.

THE COLONIAL NURSING ASSOCIATION.

SIXTEENTH ANNUAL REPORT FOR THE YEAR ENDING MARCH, 1912.

The Colonial Nursing Association, established in 1896, for providing Trained Nurses for Hospital and Private Work in the British Colonies and Dependencies, and amongst other British Communities abroad.

THE nurses sent out are not only available for Government Hospital work, but a large number are yearly supplied to different parts of the world as private nurses.

Since April 30, 1897, when the first instalment of nurses were sent abroad under the auspices of the Association, until March 31, 1912, no fewer than 440 nurses were sent for Government and 219 for private work, making a total of 659. The number has gradually increased from 3 Government and 3 private nurses sent out during the first year, to 40 Government and 30 private nurses for the year ending March 31, 1912. The numbers of Government nurses supplied to various countries are as follows: Africa (British East Africa and Uganda), 8; Africa (Nyasaland), 4; Africa (West), 41; Africa (South), 2; British Guiana, 3; Ceylon, 18; Cyprus, 2; Falkland Islands, 2; Gibraltar, 6; Hongkong, 15; Straits Settlements, 12; Federated Malay States, 17; St. Helena, 3; Seychelles, 1; West Indies, 41. Private nurses have been sent amongst other places to: Bangkok, British North Borneo, Costa Rica, Cyprus, Japan, Las Palmas, Lisbon, Madrid, Mauritius, Oporto, Rhodesia, Shanghai, Teheran, Tientsin, Venice, Western Australia, and Zanzibar, as well as to several of the Crown Colonies where Government nurses have been sent as mentioned in the above lists.

The good that these nurses have done is incalculable, and the comfort they bring to our countrymen and countrywomen is evidenced by the letters of thanks which have been forwarded to the Association. Previous to the beneficent work of the Colonial Nursing Association in our Colonies and dependencies, not only the private nursing but the nursing in the Government hospitals was entrusted to native women and to coolies, who, although on many occasions, they did arduous work, performed with all kindness, were quite incompetent to carry out the doctors' instructions and wholly unskilled in the rudiments of nursing. They were, except in occasional instances, unable to read or write English, keep a temperature chart, or do more than serve as a "hospital hand."

Amongst the many societies founded in this country to relieve the sick and suffering none can be more highly commended than the Colonial Nursing Association, none deserve more generous support, and it may be safely said nothing brings more comfort to men or women in a foreign country than to be tended in illness by a skilled nurse of their own nationality.

Abstract.

A NEW TREATMENT OF PELLAGRA, WITH THE "ORGANO-MINERALIZED RADIO-ACTIVATED SERUM," OF DR. JEAN NICOLAÏDI, PARIS, FRANCE.

In the *Rivista Pellagrologica Italiana* of November, 1911, the official pellagra-paper of the Italian Government, Drs. Grillo and Maj publish the experiments made with the new treatment of Dr. Jean Nicolaïdi, of Paris, consisting in an "organo-mineralized radio-activated serum."

Dr. Jean Nicolaïdi, connected with the laboratory of the eminent Professor R. Blanchard of the Faculty of Medicine of Paris, and former pupil of Londouzy and Widal, began his pellagra studies a few years ago, at the instigation of his father, a physician in Roumania, where pellagra is widely developed (more than 80,000 cases) and in most grave form.

This disease also exists in Spain, Portugal, the South of Russia, Algeria, a great number of British Colonies, Egypt (Sandwith, Warnock), India, South Africa, &c.

After a long study of the nutritive exchanges in pellagrins, and the troubles of the metabolism of the organic and mineral elements, Dr. Jean Nicolaïdi recognized the utility of the two following indications:—

(1) Neutralization of the "toxine"—or the "virus" which pellagra produces in the organism.

(2) Awakening of the intimate intracellular activities, and the reparative forces tending to remedy the deficits caused by the malady. For this purpose he adopted an "artificial organo-mineralized serum," which he rendered radio-active by a special process.

After long experiments in the study of the importance of each of the elements of the sero-plasma, and the proportions in which it was best to utilize them, and after trying numerous processes with a view of insuring to the elements their maximum of activity, Dr. Nicolaïdi was able to unite all the elements extracted from the horse-serum by evaporation in the vacuum, which he treated subsequently by means of a solution saturated with carbonic acid containing all the organic and mineral salts of the blood plasma.

In order to guarantee in the organism the best fixation of the elements and consequently the maximum utilization of its components, to render the serum more active and "vital," he adopted the plan of making it radio-active by a special process of great efficiency.

As a matter of fact, radio-activity is an essentially energetic form of therapy. Wickham* has demonstrated the bacteriocidic action of the alpha radium rays. These same rays should also serve as the principal energetic source, when it is proposed to raise diastasic force†, which, in the light of late discoveries, play a part in all vital reactions of the organism. Radio-activity increases the activity of the tissues and of the nutrition.‡ Clinical experience has verified the stimulating power of radio-active substances on the phenomena of elementary nutrition and on the vitality of the tissues.§

Nicolaïdi undertook a great number of experiments on animals with the aid of this serum, and noticed by the urinary, fæcal and blood examinations that the nutrition of the animals was found to be favourably influenced.

Many of these studies and experiments took place in Professor R. Blanchard's parasitological laboratory at the Faculty of Medicine of Paris.

Considering pellagra as a toxi-alimental malady, Nicolaïdi thought that he could make use of the data taken from experiments on animals, with the purpose to obtain: (1) The neutralization of the toxine accumulated in the organism; (2) an awakening of the activities of the intimate intracellular nutrition.

Thus, already in 1909, he began his experiments with his father in Roumania. The cases subjected to the serum treatment were all in a very bad state; they had been treated, without any result, in the classical way with arsenic, iron, different tonics, &c., and were put for a long time under the best dietetic conditions.

The cures or rapid improvements obtained in a short time on these patients, on whom nothing could be obtained by the ordinary methods, decided the Roumanian Goverment to appoint, in 1910, Dr. Jean Nicolaïdi with an official mission for a new series of experiments, which took place at the Preda Hospital in Craiova, under the control of Dr. Vernesco, the chief physician of the hospital.

The cases chosen for this new series of treatment were also all in very serious conditions with extremely pronounced cutaneous, gastro-enteric and nervous symptoms.

The result of the experiments made at the Preda Hospital in Craiova during 1909 and 1910 were collected in a report sent by Dr. Vernesco to the General Director of the Sanitary Service in Bucarest. In his conclusions Dr. Vernesco says:

"The improvement begins after a few injections, according to the gravity of the cases. Usually the digestive and nervous symptoms are those which commence to improve. Thus the diarrhœa, agitation, nightmares and dizziness are calmed steadily and finally disappear. The imbecility disappears, the patients regain consciousness, and become more active with improved spirits.

"The desquamation proceeds rapidly and usually in the following order: Beginning on the face, and continuing on the chest, the body and the hands, terminating on the feet.

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* Wickham: *Annales de dermatologie et de syphiligraphie*, Paris, 1906.

† Pozzi-Escot: "Nature des diastases," Paris, 1905.

‡ Georges Bohn: *Revue des idées*, January, 1904.

§ Curie et Laborde: *Académie des Sciences de Paris*, 1903.

"The appetite steadily increases, and becomes voracious in some cases, and the regular ration of the hospital is insufficient. The patients clamour for more food, the corporeal weight increases by three to four kilogrammes. A regeneration of the organism and a development of the psychic faculties are noted.

"According to the foregoing, my opinion is that the serum of Dr. Jean Nicolaïdi is very efficacious against pellagra. Thus, in several cases of pellagrous patients subjected, with the object of study, to the classic treatments with arsenic, tonics, &c., without any result, I obtained, in abandoning these treatments, a complete cure after a series of injections of this serum.

"To convince myself regarding the final results of the treatment, I requested a number of the mayors to inform me of the present condition of patients living in their respective communes who had been cured by use of the serum. All those who replied informed me that the former patients were in perfect condition."

A certain number of patients afflicted with pellagrous psychosis were also treated with Nicolaïdi's serum at the insane asylum of Craiova (Roumania) by Dr. Mileticiu, chief physician of the asylum.

The patients subjected to the treatment were not afflicted with organic alterations of the central nervous system, but they presented extremely grave nervous symptoms, such as: complete imbecility, intense cachexy, extreme agitation, access of frenzy, incoherent language, altering with a period of absolute dumbness, visual and auditory hallucinations, &c. After a certain number of injections (20 to 25) some of these patients were cured, some considerably improved, which had not been effected by all the different treatments applied during months in the asylum.

The satisfactory results obtained during two years with Dr. Jean Nicolaïdi's serum in Roumania were brought to the knowledge of the Italian Government, and Dr. Nicolaïdi was officially appointed by it to undertake experiments in Italy. These experiments took place last summer and autumn in the province of Udine, one of the most afflicted in Italy, and under the control of Professor Antonini, Director of the Insane Asylum of Udine, and one of the well-known pellagrologists.

The cases chosen for these experiments were all in a most advanced state. In spite of all treatments tried during long months, no satisfactory result could be obtained on those patients who were afflicted. With grave gastro-enteric symptoms as: diarrhœa (5 to 30 profuse, fetid stools per day), continual pyrosis, intense thirst and burning in the mouth, swollen lips, appetite lacking, disordered taste, tongue void of epithelium, cracked lips, erosion of mucous membrane of gums, gastralgia, vomitings; with very marked nervous phenomena as: headache, vertigo, insomnia, buzzings, terrifying nightmares, extreme agitation, access of frenzy, mental depression akin to hypochondria, imbecility, incoherence of language alternating with periods of absolute dumbness, visual and auditory hallucinations; with a very bad general state: miserable aspect, organic weakness and numerous ailments, general fatigue, impossibility to work and even to attend to housework, impossibility to stand alone, signs of premature senility, intense cachexy, &c. The cases have been subjected to Dr. Nicolaïdi's serum treatment at the insane asylum of Udine, by Dr. Volpi-Ghirardini, sub-director of the asylum, and at Martignacco, near Udine, by Drs. Grillo and Maj. In their conclusions, Drs. Grillo and Maj describe as follows the results of their experiments in the *Rivista Pellagrologica Italiana*:—

"All the patients treated with the organo-mineralized radio-active serum have shown a marked improvement in a short length of time, with the exception of a case of mixed intoxication (pellagra and alcohol) in which delirium tremens predominated, and another case with grave psychic phenomena.

"The most salient points which most impressed us, was the regularizing of the intestinal evacuations in a very short time—after five to six injections.

"The state of the nutrition with all the patients was notably influenced by the cure, and at the same time as the reawakening of the nutrition was observed the return of strength, to such an extent that most of the patients were able to resume their occupations, which they had long since abandoned.

"The subjective troubles (sensation of physical prostration, buzzings, vertigo, pyrosis, anxiety, &c.) and the vaso-motor phenomena were either attenuated or abolished. The reflexes were not changed. The surface of the tongue was regenerated almost completely in the majority of cases."

Numerous urological analyses, made at the beginning and at the end of the therapeutic experiments, proved that the nutrition was found to be favourably influenced. It must also be noted that all these patients have been left, during the treatment, in the same dietetic conditions in which they were before the therapeutic experiments, nothing having been changed in their *modus vivendi*.

Another series of successful therapeutic experiments with Dr. Nicolaïdi's serum took place at the departmental Insane Asylum of Treviso, under the control of Dr. Zanon, director of the asylum.

Among the numerous cases treated by Dr. Nicolaïdi's serum, and published by Drs. Grillo and Maj, with full particulars in the *Rivista Pellagrologica Italiana*, we report the two following in which the gastro-enteric and nervous symptoms were particularly grave:—

Case 7.—Received September 3, 1911. M. Agnese, woman, aged 31 years. Antecedents: father died of tuberculosis; mother living and in poor health, not appearing to have suffered from pellagra. Patient had typhoid fever seven years ago; has had pellagra two years ago, beginning with serious diarrhœa, rebellious to all treatment, and lasting eighty days, and with sensation of general prostration. Last spring recurrence of diarrhœa,

with desquamative erythema on back of hands, and of appetite, pyrosis, vaso-motor troubles, vertigo, buzzings. Seven normal childbirths—five boys and two girls, of whom three are dead and four living, the latter being in good health. The youngest, six months old, nourished by the patient. Alimentation mainly of maize; and indifferent aqueduct water. Treatment followed: Astringents, tonics. Patient has been in a "sanitary home."

Present state: Cutaneous phenomena; traces of desquamative erythema on hands in process of cure; subcutaneous cellular tissues only slightly evident; organic wasting.

Gastro-enteric symptoms: Pyrosis; lack of appetite; sensation of heaviness in epigastric; diarrhœa twenty to thirty stools a day; abdominal walls flabby; tongue cracked.

FIG. 1.

Roumania.—Pellagrous Psychosis (Babes).

Respiratory organs: Examination negative.

Circulatory organs: Heart sound; weakened.

Nervous symptoms: Constant headache; no sensorial troubles.

Sight: Weakened since she has been ill.

Hearing: Normal.

Sleep: Insomnia; dreams; nightmares (terrifying); continual vertigo.

Reflexes: Left knee, exaggerated; pharyngeal abolished; right pupil normal.

Sensibility: Tactile hyperesthesia; muscular sense preserved; no trembling; gait normal.

Genito-urinary organs: Amenorrhœa, because she is nursing.

General condition: Paleness; malnutrition; emaciation; marked organic wasting; absolute incapacity to work, tiring at least effort.

Wassermann reaction negative. Weight 50 kilos.

September 5.—First injection, 25 c.c. in right buttock. A few vasomotor phenomena, to which she is subject. Yesterday twenty diarrhœa stools. To-day, at 7 in the morning, already had three; liquid and fetid. Has had her diarrhœa two months, with numerous stools day and night.

September 7.—Second injection, 50 c.c. left buttock; feels pains; does not feel the phenomena she felt during first injection. Yesterday, twelve to fourteen stools (liquid). This morning before 7 o'clock six stools; sleep agitated; appetite restricted; pyrosis; headache.

September 9.—Third injection, 50 c.c. right buttock; slight pain, disappearing in a few minutes. Day before yesterday, after the injection, five or six more stools. Yesterday ten stools, liquid and fetid. This morning, before 7 o'clock, three stools. Very little appetite; all the phenomena observed continue.

September 11.—Fourth injection, 50 c.c. left buttock. Day before yesterday five to seven liquid fetid stools. She thinks, however, there is some improvement as regards the diarrhœa.

September 13.—Fifth injection, 50 c.c. Yesterday seven liquid stools; still fetid. This morning, before the injection, one stool; severe pain after the injection; declares she is better as regards the vasomotor troubles, to which she is subject; strength also seems to increase.

September 15.—Sixth injection, 50 c.c. Yesterday she had two stools; to-day one; a little more consistent. Slight pain after the injection; no other local reaction; says she had some fever during the night, thereby somewhat fatigued.

September 17.—Seventh injection, 50 c.c. Yesterday one liquid stool, to-day another of same nature; some pain; has her menstruations since yesterday; about seven months since her delivery; appetite restricted; vertigo continues, though lessened; patient feels sensation of general improvement; legs are stronger; exertion, however, fatigues her.

September 18.—Eighth injection, 50 c.c. Yesterday two stools, to-day one; more consistent.

September 21.—Ninth injection, 50 c.c. Yesterday two stools (nearly solid), to-day one.

September 23.—Tenth injection, 50 c.c.; slight pain, with irradiation along the member. Yesterday two pultaceous stools; to-day, none thus far.

September 25.—Eleventh injection, 50 c.c. Yesterday one stool (solid; to-day one, well-formed, before the injection); patient feels exhausted; headache diminished; vasomotor troubles disappeared.

September 26.—Twelfth injection, 50 c.c. in left; suffers from previous injections; severe gastralgia during last two days; normal stools since the 24th of this month.

September 30.—Thirteenth injection, 25 c.c. in left; injection is incomplete, because of hardening of tissues, which prevents liquid from penetrating and provoking insupportable pain. Yesterday one stool; normal. The patient is contented, because the diarrhœa has ceased and she no longer has the sensation of prostration. Also improved as regards headaches and vasomotor troubles; appetite and strength increased, but not to the point of resisting fatigue.

October 2.—Fourteenth injection, 50 c.c. in right; stools normal; appetite bad; nutrition still insufficient.

October 4.—Fifteenth injection, 50 c.c. in right;

FIG. 2.
Austria.—Desquamative erythema (Merk).

intense pain; patient declares that since the beginning of the cure her baby, which she is nursing, is much improved as regards general nutrition. The baby finds the maternal milk sufficient, which was not the case before the treatment.

October 6.—Sixteenth injection in left; nursing discontinued during the last three days; marked improvement now as regards general condition, strength and appetite; vertigo practically disappeared; headache rare; disappearance of the usual vasomotor troubles; stools continue normal; pain after the injection.

October 8.—Seventeenth injection, 50 c.c. in right; has suffered from previous injections; and from that of to-day—thinks she has some fever—stools normal.

October 10.—Eighteenth injection in left; has had a few momentary troubles as result of suspension of nursing; diuresis abundant.

October 12.—Nineteenth injection in right; no pain; stools normal; feels general condition improved; says that before the treatment her food tasted insipid and had to have great quantity of salt; her troubles now very much diminished, and she no longer craves salt in food; she declares also that the treatment has relieved her greatly from all her troubles; has desire to return to her work; can be busy all day without fatigue.

October 14.—Twentieth injection, 50 c.c. in left; stools still normal; appetite good; circulatory phenomena much improved; now drinks very little water, whereas she formerly suffered from intense thirst,

FIG. 3.
U.S.A., South Carolina State Board of Health.—Wet case showing superficial gangrene (Dr. J. J. Watson, Columbia).

which obliged her to drink, at night particularly, great quantities of water (she drank about a litre and a half in two draughts). The buzzings and fatigue have ceased; strength increased; can walk without fatigue; nutrition is generally improved. Weight, over 51 kg.

CASE 9.—Received September 19. B. Giuseppe, a man aged 54 years. Antecedents: Unable to say exactly of what his parents died. A brother living has suffered from pellagra. Patient had bronchial pneumonia three years ago.

First appearance of the malady and symptoms experienced thus far. Present malady began in June of last year with profuse diarrhœa (liquid and fetid); four to twenty stools per day. In spite of all treatments, diarrhœa has never ceased. Some improvement, however, last winter as regards number of

stools. Last spring recrudescence of the diarrhœa, accompanied by erythema, diffused and desquamative on back of hands. Thus far has had no permanent improvement from the numerous cures followed. Recently, in addition to the diarrhœa, has suffered from loss of flesh, anæmia, lessening of strength, and a diffused œdema of the lower extremities. The face also is somewhat swollen. On account of this pronounced œdema, been obliged to remain in bed a week recently.

Alimentation: Almost exclusively of maize; has eaten bread since last June; aqueduct water.

Treatment followed: Astringents, disinfectants, opiates, climatic and constitutional cures in mountains.

Present state:—

Cutaneous phenomena: The skin presents a shiny cicatrical aspect, with no trace of erythema.

Gastro-enteric: Diarrhœa since last year (eight to ten stools a day, liquid and fetid); tongue "geographic"; belly meteoric-aplanchtroptosis.

Respiratory organs: Persistent cough for some time; nothing notable in lungs.

Circulatory organs: Cardiac pulsations; pulse weakened.

Nervous symptoms: Headache at times; no sensorial troubles; no vertigo; sight weakened; conjunctivæ much injected; pupils equal, reacting well to light and to accommodation.

Sleep normal. Hearing normal.

Reflexes: Right knee normal; left sluggish; right plantar, flexor type, normal; pharyngeal and conjunctival, normal.

Sensibility: Normal.

Œdema: In members; œdema diffused in face.

General condition: Colour of skin and mucous membranes of an extreme paleness, waxy and dried; face is swollen.

Been unable during past year to work in fields. Weight, 62 kg.

September 20.—First injection, 40 c.c. in right buttock; experiences pain; yesterday, six to eight liquid fetid stools; to-day, one previous to injection; patient feels weak; profuse perspiration in night; intense thirst.

September 22.—Second injection, 50 c.c. in left; slight pain, disappearing a few minutes after massage; day before yesterday, several liquid stools following the injection; yesterday three stools, likewise liquid.

September 23.—Third injection, 50 c.c. in right; feels pain; yesterday, after injection, three liquid stools.

September 24.—Fourth injection, 50 c.c. in left; slight pain soon disappearing; yesterday, after injection, two stools, somewhat modified; one to-day before the injection; intense thirst; nocturnal perspiration; light appetite; dulled taste in mouth.

September 26.—Fifth injection, 50 c.c. in right; yesterday two stools; one this morning before injection; patient thinks he feels better generally.

September 28.—Sixth injection, 50 c.c. in left; yesterday four liquid stools; one this morning.

September 30.—Seventh injection, 50 c.c. in right; yesterday three stools, somewhat more consistent; declares he feels better; diuresis much increased.

October 2.—Eighth injection, 50 c.c. in left; preceding injection produced pain more severe and of longer duration; region is infiltrated and painful; yesterday three stools of better formation; one to-day; swelling of face nearly disappeared, giving patient aspect of emaciation; œdema of members also notably decreased; waxy paleness of skin continues.

October 4.—Ninth injection, 50 c.c. in right; severe pain; day before yesterday, after injection, three stools; yesterday two (pultaceous); to-day one; use of hot water compresses has dispelled the infiltration of tissues.

October 6.—Tenth injection, 50 c.c. in left; day before yesterday two stools; yesterday also two; to-day one; patient declares these are modified, being more consistent; diuresis continually increased; thirst diminished; œdema of members decreasing rapidly.

October 8.—Eleventh injection, 50 c.c. in right; day before yesterday two consistent stools; yesterday two of same nature; night sweats; feels much improved in general condition.

October 10.—Injections suspended because of pain caused by preceding; infiltration of the region; peripheral œdema extending to lower extremities.

October 12.—Twelfth injection, 50 c.c. in left; pain; infiltration and œdema are diminished; during last three days, two pultaceous stools per day.

October 14.—Thirteenth injection, 50 c.c. in right; yesterday two pultaceous stools; appetite excellent; diuresis abundant; night sweating diminished; improvement in sense of taste.

October 16.—Fourteenth injection, 50 c.c. in left dorsal region; no pain; yesterday two stools (pultaceous).

October 18.—Fifteenth injection, 50 c.c. in right dorsal region; injections in this region are better supported; yesterday two pultaceous stools; patient says that during last few days the stools, instead of following in close succession, are spaced at intervals of ten to twelve hours; there remains some œdema in members.

October 20.—Sixteenth injection, 50 c.c. in left thoracic region; light pain, which disappears with the massage.

October 22.—Seventeenth injection, 50 c.c. in right dorsal region; very little pain; yesterday two stools (pultaceous); declares he feels very much improved; can work a little in the fields without overmuch fatigue.

October 24.—Eighteenth injection, 50 c.c. in left dorsal region; yesterday two stools (pultaceous); diuresis abundant; thirst practically disappeared.

October 26.—Nineteenth injection, 50 c.c. in left dorsal region; very little pain, which disappears with massage; yesterday three stools (pultaceous); œdema of members notably diminished; general improvement increases progressively.

October 28.—Twentieth injection, 50 c.c. in left thoracic region; pain insignificant; day before yesterday one well-formed stool; yesterday one somewhat less well formed, and another of the same nature in the evening.

November 4.—After a few days of rest the patient is advised to submit to five more injections, to which he acceded willingly. Twenty-first injection, 50 c.c. in right thoracic region; slight pain; two stools per day, at ten to twelve hours intervals, and practically normal in form; patient declares he feels his strength returned to the extent that he can attend to greater part of his regular work.

November 6.—Twenty-second injection, 50 c.c. in left thoracic region; slight pain.

November 11.—Twenty-third injection, 50 c.c.; general condition excellent; patient has resumed his normal occupations; feels no more fatigue as result of day's labours; œdema disappeared; general nutrition improved. Weight 64 kilos.

November 18.—The patient reports to us that the benefit of the cure is sustained, with normal stools, and no more œdema at all.

Professor Antonini, appointed by the Italian Government for the control of all these therapeutical experiments, gives his impression as follows, in his introduction on Drs. Grillo's and May's work, published by the *Rivista Pellagrologica Italiana:*

"It gives me pleasure to certify that the therapeutic treatment was accomplished with all the precautions and guarantees of sincerity and precision possible," and "that we have found a means of fighting against pellagra at the moment when energetic methods may be necessary."

The following confirmatory letter was sent to Dr. Jean Nicolaïdi, by the Medical inspector of the Province of Udine:—

"Royal Prefecture of Udine.

"Udine,

"*November* 20, 1911.

"On November 5, accompanied by Cavalry-Officer G. B. Cantarutti, Secretary of the Inter-Provincial Pellagrologic Committee, and Professor Ugo Soli, Director of the Governmental Laboratory of Udine, I had the pleasure of inspecting the nine grave cases of pellagra which you, together with Dr. Umberto Grillo, had treated by means of the organo-mineralized radio-activated serum.

"The results obtained, which Dr. Grillo will publish soon in our 'Pellagrologic Review,' certainly could not have been more conclusive, and I join in the congratulations due to you for this remarkable discovery which, without a doubt, will bring relief to the countries stricken with the endemic disease of pellagra.

"I have the honour to remain, &c.,

"Dr. Fratini."

Professor R. Blanchard, of Paris, brought to the knowledge of the Academy of Medicine of Paris Dr. Jean Nicolaïdi's studies and the results of his two missions in Roumania and Italy.

In his lecture given at the Academy of Medicine, Professor Blanchard, as to the result of Dr. Nicolaïdi's mission in Roumania, says: "The results obtained are most remarkable; the patients were cured or improved in a most notable manner. Passing myself in Craiova at the moment when the experiments were finished I could effectively establish the considerable improvements obtained."

Concerning Dr. Nicolaïdi's mission in Italy, Professor Blanchard says: "The Direction of the Italian Public Health Service accorded Dr. Nicolaïdi the best reception; through the Prefects and Authorities he was presented to Professor Antonini, the eminent pellagrologist, director of the 'Manicomio,' of Udine.

"Received at first with the greatest courtesy, but also with a certain scepticism, he noticed the attention gradually manifested by the physicians, then their interest, and at the end their satisfaction, as the cases, the most rebellious against all treatments and until then the most incurable, chosen for testing fully the efficacy of the treatment, improved from day to day until complete cure. The regularization of the intestinal evacuations was one of the most remarkable therapeutic results. Enteritis, rebellious for a long time against all treatments, with five to thirty diarrhœic stools per day, was cured after ten to twelve injections."

Numerous are the American scientists who have pointed out the wide prevalence of pellagra in recent years in the United States.

The papers read and the reports presented at the last National Conference on Pellagra, held at Columbia, November, 1909, by Drs. C. H. Lavinder, P.A. Surgeon, U.S.P.H., and M.H. Service, Washington; J. W. Babcock, Superintendent of the State Hospital, Columbia; J. W. Kerr, U.S.P.H., and M.H. Service, Washington; C. F. Williams, Secretary of the Board of Health, Columbia; Geo. A. Zeller, Superintendent, State Hospital, Peoria; H. F. Harris, Secretary, State Board of Health, Atlanta; E. B. Saunders, State Hospital, Columbia; C. W. G. Rohrer, Baltimore; C. C. Bass, New Orleans; J. W. Mobley, State Sanitorium, Milledgeville; Rea Parker, First Assistant Physician, Eastern State Hospital, Williamsburg, &c., recognized the necessity of a "further study of pellagra in the United States, in order to preserve and protect the health of our people from a scourge that threatens to become national."

"Now we are face to face with the condition," says Dr. Geo. A. Zeller, "we should meet it energetically, intelligently, and always with the feeling that we are menaced with a national scourge."

"Suddenly," says Dr. Rea Parker, "we found ourselves the victims of this dreadful malady, which has proved a veritable scourge to portions of Europe and other countries."

Concerning the relation of pellagra to insanity and certain nervous diseases, Dr. J. W. Mobley says:

"The alienist looks back with regret upon the mortality of this scourge in hospitals for the insane. He is made to reflect with deep concern for the future of his race, when he observes the powerful impress of this disease upon the mind and nervous system. The general practitioner is not so much called upon to consider pellagra in its relation to insanity. On the alienists rests the moral duty of warning his people against an infection which, once firmly rooted, will manifest its baneful influence for ever upon the human family."

"It is now established," says Dr. J. W. Babcock, "that pellagra in the United States extends from the Atlantic to the Pacific, and from the Great Lakes to the Gulf of Mexico."

As this "national health problem" is of the greatest importance for the United States, we thought it useful to give Dr. Jean Nicolaïdi's above report.

Annotations.

Infantile Beri-Beri.—Andrews, writing on *Infantile beri-beri* in the *Philippine Journal of Science*, Section B of the *Philippine Journal of Tropical Medicine* (vol. vii, April, 1912, No. 2), reaches the following conclusions:—

(1) That the high infant mortality in Manila is due to infantile beri-beri; (2) that this high death rate of infants is due primarily to the quality of the mother's milk; (3) that the mother's milk lacks something which is essential for the growth and development of the nerves of the child; (4) that the disease is not due to an infection of toxæmia of either the mother or the child; (5) that another link has been added in the chain of evidence showing that beri-beri is a nutritional disturbance; (6) that as a prophylactic measure, the dealers handling rice should be required to keep on hand the under-milled variety, and a campaign of education should be carried on for the purpose of enlightening the poorer classes, especially the pregnant women.

Cultivation of Malarial Parasites.—Bass, in the *Journal of the American Medical Association* for September 21, 1912 (vol. lix, No. 12, Part I), describes some further details concerning the cultivation of malarial plasmodia.

In the course of some later work it has been found that the malarial plasmodia can be grown in human serum, in Locke's fluid (from which calcium chloride is omitted) and in human ascitic fluid. In the majority of cases dextrose must be added to the medium in order to secure growth of the parasites. The plasmodia grow in a thin layer near the top of the cell sediment, beneath which zone the parasites all die.

The parasites have been cutivated only in the red cells of human blood, and are destroyed by the leucocytes as soon as they are liberated from the erythrocytes, and also by the serum, Locke's fluid, ascitic fluid, or, in fact, by any of the mediums experimented with.

Plasmodia develop readily in the red corpuscles, apparently digesting the substance of the corpuscles, and segmentation can be followed with great satisfaction in the cultures.

The most favourable temperature found for the cultivation of these protozoa is about 40° C. They will usually live at a lower temperature, but usually will not grow, and as a rule will not multiply.

Positive cultures have been obtained from twenty-nine cases of æstivo-autumnal malaria, six cases of tertian, and one case of quartan. The cultures have been carried on as far as four generations from the parent culture, and with proper attention to technic can doubtless be maintained indefinitely. Only the asexual cycle of the parasite has been observed in the cultures.

Assam Labourers.—Dr. Charles Roper, in a recent thesis for the Cambridge M.D., summarizes the effects of the conditions of life in Assam as it affects native labourers, their wives, and children:—

(1) The first two years of residence are the most trying for coolies, and much more so for men than for women.

(2) There is some difference between the anæmia met with in Lakhimpur and that met with in Darrang.

(3) The proportional mortality from anæmia in women increases with length of residence, in men it remains about the same.

(4) The death-rate from malaria amongst children under 5 years of age is about twice as heavy amongst boys as amongst girls. In adults it is two or three times as heavy amongst women as amongst men, this disproportion tending to increase with length of residence.

(5) The mortality from bowel complaints is very disproportionately high in comparison with that of all causes of death in the first two years.

(6) Amongst coolies over 45 years of age the mortality from bowel complaints becomes greater amongst women and less amongst men.

(7) There is reason to think that acclimatization for dysentery occurs in some degree amongst imported tea garden labour.

(8) Length of residence tends to predispose coolies to death from pneumonia.

(9) The proportion of deaths amongst acclimatized coolies from pneumonia to those from all causes, while markedly increasing in males does so in a far greater degree in women.

The Epidemiology of Bacillary Dysentery.—Hunt contributes a study of the epidemiology of bacillary dysentery to the *Journal of the American Medical Association* (vol. lix, No. 12, September 21, 1912. Part I). He believes that his researches on the subject warrant the following conclusions:—

"(1) Bacillary dysentery should always be a reportable disease.

"(2) Sufficient power should be given to the health authorities to investigate and abate any suspected source.

"(3) Less confusion to the general practitioner results from a nomenclature broad enough to include all types of the causative organism.

"(4) While there is some warrant for the terms 'dysentery' and 'paradysentery,' the more general one of 'bacillary dysentery,' in so far as preventive medicine is concerned, simplifies the problem both of diagnosis and of sanitary supervision.

"(5) There is apparently a notable lack of recognition of the ætiology and probably of the pathology of cases infected by members of the dysentery group, resulting in a longer continuance of the infecting source and a higher mortality; this is evidenced in the varied diagnoses such as 'diarrhœa,' 'winter cholera,' 'intestinal grip,' 'grip,' 'gastric fever,' 'intestinal disorder,' and many others.

"(6) Dependent on the casual association of the *B. typhosus*, outbreaks of bacillary dysentery may be followed within ten to twenty-one days by a marked increase in the number of typhoid fever cases. This occurred in five out of nine instances in Pennsylvania, and may serve as a warning of the presence of the more serious infection; the immediate abatement of the sources would probably decrease the morbidity and mortality due to typhoid fever.

"(7) When it is recalled that the major number of cases of bacillary dysentery are mild in form, being caused by Types 2 and 3; that sporadic cases probably exceed the total numbers occurring in epidemics; that sporadic cases probably account for the large proportion of deaths under two years of age accounted for statistically as cholera nostras, dysentery and diarrhœa, and enteritis; that the disease is reportable in only seven states and territories; and that in the latter the law is not enforced, the only conclusion is that we have no definite collective information about the morbidity and mortality of the infection which properly should be called bacillary dysentery."

Drugs and Appliances.

MESSRS. ZIMMER AND CO., of Frankfurt, have brought out a new preparation of quinine named Hydroquinine hydrochloric (Dihydroquinine hydrochloric). The preparation differs from quinine in that it contains 2 hydrogen atoms more than the latter. Its composition is as follows: $C_{20}H_{26}N_2O_2$. HCl+2 H_2O. Hydroquinine occurs in small quantities in the cinchona barks and is very similar to quinine as regards its properties, so that it can only be separated from quinine with great difficulty.

Hydroquinine hydrochloric forms white crystals, very easily soluble in water, and of a very bitter taste; the crystals are easily soluble also in alcohol, but insoluble in ether. It is chiefly distinguished from quinine by its neutrality towards a potass. permang. solution, which is immediately reduced by quinine. Therapeutically it is of the utmost importance that hydroquinine hydrochloric is so extremely soluble in water. Quinine hydrochlor. dissolves only in 34 parts of water of ordinary temperature, whilst hydroquinine hydrochlor. is soluble in 0.5 parts of water. Hence it may be employed with great advantage for subcutaneous injections.

The toxicity of this alkaloid has been investigated by Prof. Hunt at the Frankfort Institute for Experimental Therapy. Prof. Hunt found that the lethal dose for mice is about 0.37 milligrams per gramme bodyweight in the case of hydroquinine hydrochloric, and 0.33 milligrams per gramme bodyweight in the case of hydroquinine; thus the toxicity of both substances is practically the same. Similar results were found also in the experiments on infusoria. These findings have since been confirmed by Profs. Morgenroth and Halberstaedter, who also proved the toxicity of hydroquinine administered to mice to be no greater than that of quinine; intravenous and subcutaneous injections also showed the same degree of toxicity in both substances. Morgenroth and Halberstaedter, however, made the important discovery that the addition of hydrogen to quinine, which occurs in the vinyl side-series of combinations, causes certain modifications of action, inasmuch as the trypanocidal effect of quinine is considerably augmented.

This difference between quinine and hydroquinine in the treatment of trypanosomes infection is very striking. Of eleven animals treated with quinine, nine succumbed to the infection, whilst there was only one death among the same number of animals treated with hydroquinine.

These and analogous experiments show that, all things being equal, hydroquinine is immensely superior to quinine in the same doses, and that it provides an almost certain prophylactic protection against the infection. But a decided superiority of hydroquinine over quinine is manifest also as regards curative treatment. In cases where numerous trypanosomes are present in the blood of experimental animals, the injection of a quinine dose, as large as can possibly be borne, does not cause a disappearance of trypanosomes, and repeated injections only very rarely produce temporary disappearance for a few days. Corresponding doses of hydroquinine hydrochlor., on the other hand, injected 1-3 times on consecutive days, result in almost all cases in the complete disappearance of trypanosomes from the circulatory system. The superiority of hydroquinine hydrochlor. over quinine is thus equally striking in a curative direction.

Present results suggest the possibility of favourable therapeutic effects in human trypanosome infections through suitable dosage, in combination with other trypanocidal agents, and they also open the question whether the results of the trypanosome experiments cannot be applied to malaria. It is not impossible that hydroquinine, in doses corresponding to those of quinine, may produce cures for malaria with a better chance of non-recurrence than is afforded by quinine. Of especial interest

are the experiments with hydroquinine in malarial cases which are more or less refractory to quinine. Investigations in this direction are now proceeding, and from private communications received by Messrs. Zimmer and Co. it is evident that hydroquinine is proving a very useful remedy in this disease.

Giemsa and Werner have also pronounced hydroquinine hydrochloric to be a very efficient antimalaric, superior to quinine in its specific action. Given internally, nine grains hydroquinine hydrochlor. pro die correspond in their effects to 12-15 grains quinine hydrochlor. (administered in the form of urethane quinine). For a single intravenous injection, to effect a temporary disappearance of the sexless parasites from the circulatory system and to reduce the temperature, 15 grains quinine hydrochlor. (urethane quinine) or 12 grains hydroquinine hydrochlor. are sufficient.

Hydroquinine should be of especial importance in the treatment of malaria and other affections because, as already said, it is extremely soluble in water, and therefore applicable in injections in a perfectly neutral solution, the addition of urethane, antipyrine, &c., as practised with quinine hydrochlor., being unnecessary; nor need resort be made to the acid salt, such as quinine bihydrochlor., or quinine bihydrochlor. carbamidate, whose injections often cause indurations.

Notice.

"Professor Dr. H. Strauss, of Berlin, will lecture at the New York Post-Graduate Medical School and Hospital, Second Avenue and Twentieth Street, on October 12, 14, and 15, on the Diseases of the Stomach and Kidney. Professor Dr. Carl von Noorden, Physician in Chief to the City Hospital, Frankfurt, Germany, will also deliver a series of lectures on the Pathology and Treatment of Diabetes, Radium Therapy, and Arteriosclerosis at the same place, on October 28 to October 31 inclusive."

Personal Notes.

India Office.

From August 12 to September 19.

Arrivals Reported in London.—Captain W. H. Riddell, I.M.S.; Major A. G. E. Newland, I.M.S.; Captain H. H. G. Knapp, I.M.S.; Captain H. H. Broome, I.M.S.; Major C. W. T. Melville, I.M.S.; Major E. H. Sharman, I.M.S.; Major E. S. Peck, I.M.S.; Major M. Mackelvie, I.M.S.; Major W. O'S. Murphy, I.M.S.; Captain V. B. Nesfield, I.M.S.; Captain F. A. Barker, I.M.S.; Lieutenant-Colonel W. E. Jennings, I.M.S.; Major M. Dick, I.M.S.; Capt. R. F. Steel, I.M.S.; Major E. L. Ward, I.M.S.; Captain R. J. Bradley, I.M.S.; Captain H. B. Steen, I.M.S.

Extensions of Leave.

Captain H. M. H. Melhuish, I.M.S., 4 m.; Lieutenant-Colonel J. J. Pratt, I.M.S., 6 weeks M.C.; Major W. H. Kenrick, I.M.S., 4 m.; Captain M. R. C. MacWatters, I.M.S., 3 m.; Captain R. L. Gauden, I.M.S., 6 m. M.C.; Captain E. H. B. Stanley, I.M.S., 4 days.

List of Indian Civil Officers on Leave (including Military Officers under Civil Rules).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Carroll, Lieutenant-Colonel E. R. W. C., I.M.S., E. B. and A.
Clark, Lieutenant-Colonel W. R., I.M.S., Punjaub, 3m. 20 days, July 10, 1912.
Condon, Major de V., I.M.S., 18 m., March 5, 1912.
Fraser, Captain F. C., I.M.S., 8 m., March 25, 1912.
Knapp, Captain H. H. G., I.M.S., Burma Gaols, 17 m. 25 d., June 26, 1912.
MacKelvie, Major M., I.M.S.
Murphy, Major W. O'S., I.M.S., Bo. Med. Dept., 6 m., May 27, 1912.
Peck, Major E. S., I.M.S., Punjaub, 17 m. 17 d., June 19, 1912.
Ruzzuk, Captain S. A., I.M.S., 12 m., June 12, 1912.
Smith, Major G. M. C., I.M.S., Punjaub.
Standage, Major R. F., I.M.S., Mysore, 18 m. 5 d., April 25, 1912.
Steel, Captain R. F., I.M.S., Bo., 12 m., August 2, 1912.
Sykes, Lieutenant-Colonel W. A., D.S.O., I.M.S., Beloochistan, 19 m. 1 d., December 16, 1910.
Ward, Major E. L., I.M.S., Punjaub Gaols.

List of Indian Military Officers on Leave.

Showing the Name, Regiment, or Department, and the Period for which the Leave was granted.

Barker, Captain F. A., I.M.S.
Bidie, Major G., I.M.S.
Bradley, Captain R. J., I.M.S., 8 m., from August 13, 1910.
Broome, Capt. H. H., I.M.S.
Fitzgerald, Captain D. C. V., I.M.S., 16 m., from June 4, 1911.
Gilbert, Lieutenant-Colonel C. E. L., I.M.S., to September 20. 1912.
Haughton, Captain S., I.M.S.
Hudson, Major C., D.S.O., I.M.S., 18 m., from January 1, 1912,
Jennings, Lieutenant-Colonel W. E., I.M.S.
McVean, Captain N. N. G. C., I.M.S., 8 m., from June 12, 1912.
Melville, Major C. W. F., I.M.S.
Nesfield, Captain V. B., I.M.S.
Newland, Major A. G. E., I.M.S.
Sharman, Major E. H., I.M.S.
Stewart, Captain T. H., I.M.S., 12 m., from May 20, 1912.

Recent and Current Literature.

"New York Medical Journal," September 7, 1912.

Yellow Fever.—Agramonte contends that yellow fever is a strictly human disease. If this is so the prophylaxis of the disease should be greatly lightened. As the author says, the occurrence at irregular intervals between epidemic outbursts of the disease of the cases known as sporadic still remains a mystery, and until some solution of this anomaly is obtained the danger of epidemics will always hang over the areas in which they are met with.

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2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

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4.—Authors desiring reprints of their communications to the Journal of Tropical Medicine and Hygiene should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

PELLAGRA.

"SANDFLY PROTOZOON" *VERSUS* "ZEIST" THEORY.

By Lucius Nicholls, M.B., B.C.Camb.
Victoria Hospital, St. Lucia, British West Indies.

In your leader on "Pellagra" (September 2, 1912) it appeared to me that the arguments which were brought forward for the support of the "sand-fly protozoal" theory could be applied with equal force for at least one view of the so-called "Zeist" theory.

Supposing the view adopted is "That pellagra is caused by 'toxins' generated by micro-organisms in farinaceous food, usually corn meal (maize flour), or what is made from it." The factors therefore required are the proper degree of moisture and temperature, and these can easily be shown to depend upon the food being kept for some length of time in a damp locality.

Corn meal is probably the most hygroscopic of all meals; if a sample of this and farina is exposed in a moist atmosphere, the former will rapidly absorb moisture and become mouldy, whereas it requires much moisture and a long period of time for the latter to become favourable for the growth of moulds or other micro-organisms.

From this it is shown:—

(1) That the disease will occur almost exclusively among races who are accustomed to keep stocks of this food or are unable to obtain a continual fresh supply.

(2) The disease would seldom occur in cold weather, for it requires the advent of spring for the temperature to become favourable for the growth of saprophytes.

(3) Damp localities and the buildings of the poor would be most favourable. Therefore towns would not be infected, the buildings are better and drier and stocks of food are rarely kept, for the inhabitants can obtain a continual fresh supply.

The recurrence each year of old cases is natural, for they require less "toxin" for the appearance of symptoms.

The article states: "Pellagra in most places affects almost exclusively the field labourer and generally those belonging to the poorest migratory class." This is what would be expected, more from the "food toxin" theory than the "protozoal" theory.

The converse to the above statement is, therefore, obvious, that if the inhabitants cease to be field labourers or to be poor they will cease to suffer from pellagra. Yet in two cases your "leader" seeks further afield for an explanation of the disappearance of the disease. (*a*) Cases were common near the Nora and Nalon, but after the establishment of industries near the Nalon the disease disappeared; conceivably the original inhabitants took part in those industries, they ceased to be field labourers, and their welfare and mode of living improved, increased communication must have taken place, and instead of hoarding up corn meal in their damp huts it is probable that their food supply improved and likewise their dwellings. (*b*) In the French Landes this disease and malaria disappeared with improved drainage and increased prosperity. It would be a very strong argument against the "food" theory if pellagra had not disappeared. It is the nature of the poorer classes to spend their last penny upon improving their dietary.

The question of the Roumanians and Bulgarians is the strongest point for the "protozoal" theory, if the Bulgarians do not eat maize, which is highly improbable, for the *poorest* of all races, with the possible exception of certain fanatic tribes, are always ready to eat the food of any other race if they can obtain it; beggars are seldom choosers.

Your description of the Burano fishermen appears to me to offer as much support for one theory as the other. I have a case which appears to me somewhat analogous.

The patient in question was a woman aged about 35. She had contracted a small injury of the leg and this, which is common among labourers in the tropics, had proceeded to extensive ulceration. She was thus incapacitated from work and being a lone woman was dependent upon herself. She had limped to a damp valley in the country and attempted to subsist for some weeks upon a small stock of yams, plantains, farina, and corn meal, the latter, another negro labourer told me, "was not fit for pig food." I obtained a sample of this and its mouldy damp condition was such that it could never have occurred in a moderately dry atmosphere. When I saw the woman she was suffering from the typical signs and symptoms of pellagra, dementia, dermatitis, sore mouth, diarrhœa, refusal of food, emaciation, shrinkage of liver and spleen, and slightly lessened coagulability of the blood. I have known this village from which she came and the surrounding country for over three years and have never seen another case of pellagra from this district (the inhabitants rarely eat corn-meal).

Now the Burano fishermen being the only Burano pellagrins, is what would be expected; they probably carry their polenta to damp boats and stay out with it in damp situations; they lead a hard life and, as with most fishermen, probably are among the poorest; their food would be inferior and extremely liable to changes from organisms. The Burano artisans and women probably keep their food under drier conditions, and are more prosperous and better situated to obtain a continual fresh supply. Probably as with other diseases, including beri-beri, dampness and a hard life are predisposing factors.

In the case of the Pavinato children unfortunately nothing is stated as to any alteration taking place in their worldly welfare, possibly they devoured stale corn meal for the first time in their lives.

Naturally members of the same family being infected can be equally argued for either theory; they are open to the same infection, or their food and mode of life is similar.

The poorer classes in these parts of the world give their young children arrowroot from birth and numbers die in consequence, and it is conceivable

that if corn meal was here a staple product, this flour would be substituted for arrowroot.

I am well aware that the "leader" in question is of the nature of a summary of the work of others, and it is possible that much is not stated which would add very great support to their views, but I have been tempted to write at length and thus impose upon your time because of the statements, "It disposes of the maize hypothesis," and "Indeed, it would be difficult to find a more convincing array of facts in favour of the insect-borne theory of pellagra."

I do not profess to be an ardent supporter of either view, yet it was reading and elucidating facts similar to these that slightly inclined my opinion to the "food" theory. The study of a number of allied conditions (unfortunately seldom recognized) has also tended to impress the food theory upon me.

To attempt, however, to force all factors to fit a preconceived theory must always be a fallacy, and that is one of my reasons for writing this, that the facts can be pressed to fit either theory.

EXPERIMENTS WITH CULTURE MEDIA SUITABLE FOR USE IN TROPICAL COUNTRIES.

By CREIGHTON WELLMAN, M.D.,

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AND

ALBERT HAND, M.D.,

Special Research Student, Department of Tropical Medicine and Hygiene, Medical Department, Tulane University.

(Studies from the Laboratories of Tropical Medicine and Hygiene, under the direction of Creighton Wellman, Medical Department, Tulane University of Louisiana, No. 20.)

THE writers have carried on in the laboratories of the Department of Tropical Medicine of this University experimental investigations extending over some time, and designed to perfect and render practicable for the tropical practitioner and others various handy culture media which may be used in routine work and in research. The results of our studies are briefly summarized in the following paragraphs.

A very large number of experiments has been necessary in order to ascertain the best methods and formulæ which should be adopted as standards. In a paper of this kind the details of unsuccessful experiments are not of sufficient interest to be reported.

Many different media were subjected to tests to see if they could be prepared in a more stable and handy form for transportation and storage in hot climates, *e.g.*, nutrient agar, nutrient gelatine, nutrient broth, litmus lactose agar, blood agar, serum agar, Löffler's blood serum, the placental-extract agar (*vide infra*) devised by one of us (Wellman), &c. It was found that drying was the best means of rendering media stable as to their keeping powers, and this method, of course, restricted us largely to mixtures which do not contain proteins which are coagulable by heat.

(1) DRIED NUTRIENT AGAR.

The idea of artificially drying ordinary nutrient agar is not original with us, as the suggestion was made in the *Lancet* several years ago, and we have seen the practical value of the method demonstrated by Mr. E. Hutsching at the University of California during the summer of 1911. During the same summer Dr. Earl H. Dagget, working with one of us (Wellman) in California, showed the possibilities of the method.

According to the present writers' experiments, the best technique is the following: Ordinary nutrient agar made according to the standard methods of the Laboratory Committee of the American Public Health Association is dried in a shallow glass dish in the open air at 80° C. The medium is reduced by drying to approximately 1 per cent. of its original bulk. The brittle film left on the bottom of the dish after drying is scraped out, finely powdered in a mortar, and placed in dry sterile tubes in amounts of 0.15 grammes in each tube, which is sufficient for 5 c.c. of finished medium by rediluting. The tubes are now sterilized by dry heat at 120° C. for thirty minutes or more. On addition of boiling water the powder dissolves readily and completely, and makes an agar medium which cannot be distinguished from the original mixture before evaporation. The titration of the medium is unchanged, and various types of organisms grow upon it as readily and vigorously as upon freshly prepared agar. It is probable that agar in this form will keep indefinitely, as we have kept it for over a year in the very moist and warm climate of New Orleans without any sign of deterioration, and when dissolved again this medium proved to be as good as freshly dried samples.

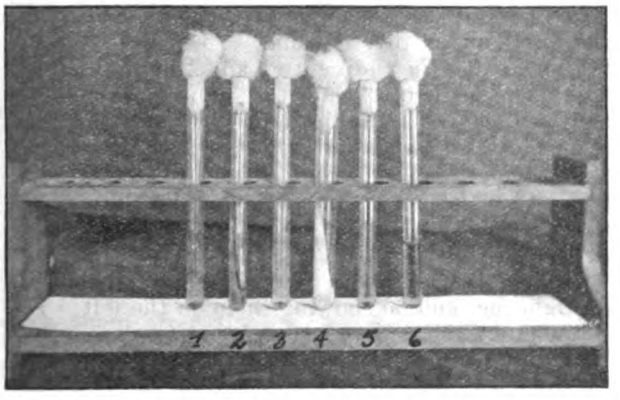
(2) DRIED NUTRIENT BROTH.

Nutrient broth made according to the standard methods of the Laboratory Committee of the American Public Health Association dries tolerably well at 80° C. Some trouble was experienced in driving off the last water, a gummy mass persisting for some time. After drying, the mass is hygroscopic and not very easily handled. This bouillon dries to 1 to 2 per cent. of the original bulk. The liquid medium should be evaporated at 80° C. in an open dish, the mass scraped out and placed in proper amounts in sterile tubes. Then it is sterilized in a dry sterilizer at 120° C. for thirty minutes. By placing 0.1 grammes in each tube it will dilute to 5 c.c. of bouillon. The dried mass dissolves readily and completely on the addition of the water if the latter is boiling. In the resulting medium typhoid and other organisms grow as well as on ordinary laboratory media.

(3) Dried Blood Serum.

This is much more difficult to prepare than the foregoing, but should appeal specially to tropical workers on account of the difficulty of obtaining and keeping sterile serum.

With aseptic precautions ox blood is defibrinated, centrifugalized, and the serum pipetted off and dried in an open dish at 56° C., with occasional addition of a few drops of chloroform, to a dry film. The serum dries to about 1 per cent. of the original bulk. The dried serum is scraped out, powdered in a mortar, and placed in tubes as follows: Small gas tubing is cut into 3-in. lengths and one end



Explanation of Figure.

1, dried nutrient agar; 2, same dissolved and slanted; 3, dried blood serum; 4, same dissolved in melted agar and slanted; 5, dried nutrient broth; 6, same dissolved in water.

sealed, the other end being plugged with cotton, and sterilized at 150° C. About 0.2 grammes of dried serum—enough for 2 c.c. of finished serum—are placed in a cooled tube, about five drops of chloroform (enough to moisten thoroughly the powder) are added, and the cotton plug is replaced.* After twenty-four hours the tube is heated to 56° C. to drive off any remaining traces of chloroform, the cotton plug removed and the open end sealed.

Serum thus prepared dissolves tolerably well in warm water, and mixes with cooled melted agar fairly well.

In drying any of the above, an ordinary oven in which bread is baked, heated to the required temperature, may be used instead of a dry sterilizer. Of course, all glassware, mortars, &c., used must first be sterilized by dry heat in such oven or in a sterilizer.

(4) Wellman's Placental Agar.

While this medium has been described both in the *Centralblatt für Bakteriologie* and in the *Journal of the American Medical Association*, yet for the use of tropical workers who may have access to neither of these publications, it seems worth while to repeat in this connection the technique of preparing this new and useful adjunct to the repertoire of the bacteriologist.

Fresh human placenta is thoroughly ground up in a meat chopper, after first washing out the blood by running sterile salt solution through the attached vessels. To each kilo of the macerated placental tissue is added 1 litre of distilled water. This mixture is allowed to infuse for forty-eight hours at refrigerator temperature, after which it is passed through a No. N Berkefeld which has been previously tested and found to hold back ordinary bacteria. The first half-hour's filtrate is usually found to be perfectly sterile. To facilitate this filtration the cylinder of the filter is filled with fine, clean, sterile sand until the candle is completely covered. The filtrate is either tubed or added to 2 per cent. sterile, previously melted agar at 40° to 41° C., mixed, and slanted. No titration or other preparation is necessary, except that the medium is placed at a temperature of 40° C. for two days to inactivate the complement, as suggested by Bass in the use of human blood cultures.

Any of the preceding media may be prepared by the isolated tropical worker with the meagre apparatus often at his command. The only special piece of apparatus needed in any of the procedures is the Berkefeld.

Those who have had experience with the drying out of liquid and solid media in hot climates will doubtless appreciate the dried agar, broth and serum, as these will keep at least a year under tropical conditions, and probably indefinitely. The placental medium (which can be prepared by the merest tyro in bacteriology, and placentæ are usually obtainable in every country) has been found of the greatest value in our laboratories. Fresh human placenta contains over 30 per cent. of the hydrolyytic products of protein digestion, and will therefore secure growths of strictly parasitic or feebly vegetative bacteria, and possibly protozoa, that are grown with great difficulty or not at all on ordinary media. For instance, the acid-fast organisms from bits of leprous tissue, either of human or rat origin, grow on this medium so readily that microscopic growth can be discerned in from five to seven days. From human tubercular glands, urine, or cerebro-spinal fluid the same method will give a growth of *B. tuberculosis* that can be distinguished in from seventy-two hours to a few days.

The above experiments are published for the use of that large class of workers in hot countries who prefer to make their own media, in the hope that, as all the manipulations are simple and easy, the suggestions may prove useful in tropical practice and research.

* In case there is any doubt regarding the sterility of the dried serum, this process may be repeated on several successive days before finally heating and sealing.

PIGMENTED MACULÆ ON THE BODY.

By Lieutenant Colonel R. H. Castor, I.M.S.
Burma.

In the Journal of Tropical Medicine and Hygiene of April 15, 1912, there was a very interesting article on " Some of the Physical Character-

istics of the Mongol," and of the many points mentioned, Mongoloid maculæ were not referred to. Herr Bealz alludes to them thus, "I now come to a test which is one of the most interesting in the whole of anthropology, *viz.*, the patches on the skin of Mongolian children. Until I described them eighteen years ago these patches, strange to say, had never been considered, and even now they appear to be unknown to most anthropologists. Every Chinese, every Korean, Japanese, and Malay is born with a dark blue patch of irregular shape in the lower sacral region." Consiglio in *La Padiat*, of July, 1911, states that this condition "was supposed to be a special peculiarity of Japanese babies." He examined 1,457 children at Parma for them, and found them present in thirty-two cases. In the JOURNAL OF TROPICAL MEDICINE AND HYGIENE of April 15, 1912, I published a paper on "Pigmented Maculæ of the Tongue, Gums, and Palate." The present paper is to continue the series on Pigmented Maculæ as found on the body externally; I hope therefore that it will be considered interesting as showing the distribution and extent of these marks among the Burmese.

Number of Cases examined.—Of the 3,000 cases examined these pigmented patches were found in 1,721, or 57 per cent., of them. Of the total cases examined there were 1,551, or 52 per cent., of males, and 1,449, or 48 per cent., of females. In the cases found 915, or 53 per cent., were males, and 806, or 47 per cent., females. It will be seen later that the percentages vary according to age, and the younger the person the higher the percentage, and *vice-versâ*. It is therefore very necessary when examining persons for these pigmented patches to enter the age for each. In this paper I have divided the age limit into three main classes.

Ages of those examined.—Of the cases 1,472 were under 1 year, 1,148 were between 1 and 3 years, and 380 were over 3 years. The youngest was at birth, and the eldest was 5 years of age.

Under 1 Year.—Of these 730 were males and 742 were females. The patches were found in 72 per cent. of them. Of these, males constituted 76 per cent., and females 68 per cent. The male percentage is therefore higher. I have no doubt that if children under six months had been separately examined, the percentage would have been still higher, and I regret that I did not fix the age limits of the lowest class to those of three months and younger.

Between 1 and 3 Years.—Of these 590 were males and 558 were females. The patches were found in 44 per cent. of them. Of these the percentage for males came to 43, and for females to 44. The female percentage is slightly higher.

Over 3 Years and under 5 Years.—Of these 231 were males and 149 were females. The patches were found in 42 per cent. of them. The percentage for males came to 47, and for females 33. The male percentage is again higher and greater in proportion to those who were under 1 year of age.

Remarks.—These figures show that the marks found vary according to age, and that while it is higher among males under 1 year and over 3 years, it is slightly higher among females between 1 and 3 years. These patches are supposed to be universal and some put their frequency at 94 per cent., but general statements not accompanied with figures must be accepted with reserve.

Distribution of the Patches.—The parts of the body were divided into six principal regions so as to define these marks as accurately as possible and within the limits fixed. They were found in the following positions: Sacral region and buttocks, waist, arms, legs, shoulders and parts between, head, face, and neck. Sometimes they were equally divided on both sides and sometimes not.

On the Buttocks and Sacral Region.—815 of the cases fell under this heading. 346 were on the right side, 255 in the centre, and 214 on the left side. The percentage for the right side came to 20.1, the centre 14.8, the left 12.4, and the total to 47.3 of all those found with patches.

The Waist was a difficult region to define accurately. On the right the marks were found in 247 cases, on the left in 222 cases, and the total came to 27.3 per cent.

On the Arms.—There were 71 children showing the right leg, and 66 showing them on the left. The total came to 11.8 per cent.

On the Legs.—There were 82 showing marks on the right leg, and 66 showing them on the left. The total came to 8.6 per cent.

On the Shoulders.—There were 63 showing marks on the right side, and 23 on the left side. The total came to 5 per cent.

On the Head.—The marks varied with the complexion of the patient. In fair children they were distinct and accounted for 40 per cent. of the cases. In dark-complexioned children the marks, if present, were not visible. In a few cases they covered practically the whole of the scalp, or left a ring around the scalp devoid of pigment.

On the Face the marks were found in very few cases, only 2 per cent. Herr Bealz states they were never found on the face.

On the Neck they were found in 5 per cent. of the cases, chiefly on the nape of the neck.

Size of the Patches.—They varied from a threepenny-bit or less to patches of 8 in. square more or less with various other shapes. The great majority of them were of large size and averaged 3 in. or 4 in. in area and of different forms.

Shape of the Patches.—They were of extraordinary shapes with regular and irregular edges, some square, others oblong, the others more or less round, and this was the most common. The characteristic point about them was their want of any uniformity. I have never seen them appear in streaks or dots as has been described by others.

Colour of the Patches.—The colour of the patches was more of a blackish-blue than any other colour, and they were of different shades of this colour. In no cases were they pinkish, red, or violet. Further, in some of the patches there were darker-

stained islands within them. The colour of the patches on the head became more marked whenever the child happened to cry. Perhaps the closest description to the colour would be to compare them to a bruise which is in the last stage of recovery. They do not disappear on pressure, and they fade sometimes abruptly and sometimes not into the healthy skin.

Number of the Patches.—They varied a good deal. In a small number of cases there was only one, in others—more numerous—there were several. The average was 5 or 6, and the largest number was 15.

Appearance and Disappearance of Patches.—In the great majority of cases the persons were examined at varying intervals after birth, so that the date of appearance of the marks after birth unfortunately cannot be given. There is no reason to doubt, however, that the patches are present at birth. The earliest instances I can give in support of this are—in one case a child was examined at birth, in another within twenty-four hours after, and several within a few days of birth. Further, of 63 cases examined within a month *all* of them showed these patches, and they were chiefly found in the sacral region.

With regard to their disappearance, I have not seen them after 4 years, but some put the age at 3 years, others at 5 years, and others again at a few months, which, I think, is chiefly due to careless observation.

General Remarks.—An analysis of these cases shows the following points of interest:—

(1) These marks are more often seen in males, and especially so among those under 1 year of age.

(2) They vary according to age, and are far more common among those of tender age.

(3) They are chiefly met with in the central region of the body, and more on the right than on the left side.

(4) The sizes of the patches most often met with were fairly large.

(5) There is no uniformity about their shape.

(6) Their colour resembles that of a departing bruise.

(7) The numbers most often found were 5 or 6.

(8) They appear at birth, and disappear between the third and fourth year.

With regard to their ætiology, there is no doubt that they are atavistic, but more than this I cannot say.

To sum up, pigmented maculæ were found among Burmans in the following positions:—

	According to age.
Pigmented parts of the body ...	57 to 76 per cent.,
Pigmented gums	15.5 per cent.
Pigmented tongue	1.5 ,,
Pigmented palates	1 ,,

In the Italian children examined at Parma these patches on the body were found in only 2.2 per cent. of cases, and they were attributed to the Mongolian admixture which occurred in the fifteenth century.

To finish the subject there still remains pigmented lips, and I am gathering statistics for this at present.

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THE JOURNAL OF

Tropical Medicine and Hygiene

OCTOBER 15, 1912.

FAR EASTERN ASSOCIATION OF TROPICAL MEDICINE.

Abstract of the Transactions of the Second Biennial Congress held in Hong Kong, 1912.

THE Governor of Hong Kong, Sir Frederick Lugard, G.C.M.G.. delivered an address of welcome to the members of the Congress, who consisted of delegates and members from Far Eastern countries, from Japan to Singapore, and from the Philippines to Ceylon.

The President of the Association, Dr. T. Mitford Atkinson, gave an address upon "The Progress of Tropical Medicine during the past Twenty-five Years," drawing attention to the more important phases of work in the field of research. In malaria the discovery by Laveran of the parasite of malaria in 1880; the confirmation of the discovery in 1888 by Marchiafava and Celli; the demonstration of segmentation and sporulation in the paroxysm of the fever, by Golgi, in 1888; the differentiation of the quartan from the tertian parasite in 1889, also by Golgi; and the demonstration of the æstivo-autumnal, or malignant parasite, in 1889, by Marchiafava and Celli, marked the earlier stages of our knowledge of malaria. The framing of the mosquito malaria theory by Manson, and the practical demon-

stration of the truth by Ross in 1897 marked the final stages of the researches which gave us the definite knowledge of malaria we now possess. Dr. Atkinson drew attention to the work of Gorgas, begun in 1904, in the Panama Canal district, whereby malaria and yellow fever were held in check to such an extent that the work of cutting the Canal could be proceeded with in the hopes of success, through obtaining immunity from the prevalent diseases of the district.

Plague in Hong Kong is memorable not only from the fact that it was the early centre of plague in the modern epidemic, but it was in Hong Kong on June 14, 1894, that Kitasato discovered the plague bacillus.

The cause of sleeping sickness and the means by which it is spread was first indicated by Dr. Forde, who in 1901, found a trypanosome (described by Dutton) in the blood of a European suffering from sleeping sickness. In 1902, Castellani demonstrated the presence of trypanosome in the cerebro-spinal fluid of patients with sleeping sickness; and Sambon's suggestion that the *Glossina palpalis* is the carrier of the trypanosome was proved in 1902 by Dutton, Todd, Bruce, and Grieg.

Human tick fever, or spirillar fever, is a relapsing fever produced by a spirochæte transmitted by a tick—the *Ornithodoros moubata*. The names of Ross and Milne in Uganda, and of Dutton and Todd working in the Congo Free State in 1904, are associated with this great discovery.

Dr. Atkinson also drew attention to the description in 1893 by Gasser, of *Amœba coli* in the stools of persons suffering from dysentery; of Schaudin's differentiation of *Entamœba coli* from *E. histolytica*; and of Shiga and Flexner's notification in 1898 of a special organism in bacillary dysentery. Reference was also made to Bruce's discovery of the *Micrococcus melitensis* in 1887, in cases of undulant fever and to the part played by goats' milk in the epidemiology of the disease. Mention is also made of the discovery by Leishman in 1900 of the leucocytic parasite in a case of kala-azar and the association of the Leishman-Donovan body with kala-azar, Oriental sores, and the so-called piroplasmosis or tropical splenomegaly in North-eastern India. Castellani's discovery of spirochætes in yaws in 1905; Manson's investigations from 1881-1893, and later, 1906, Musgrave's work on "Paragonimiasis-hæmoptysis," due to parasitic (*Paragonimus*) or *Distomum Westermanii*), infection of the lung; and the workon "Beri-beri," by Drs. Fraser and Stanton, in the Malay States, by Dr. Ezekman, Gryns and de Haan, in Java, and by Dr. Aron in the Philippines, were referred to in the address, with a full appreciation of the great work accomplished by modern observers in the advancement of tropical medicine.

Discussion on Beri-beri.

(1) "Observations Regarding the Substance in Rice Polishings which prevents Polyneuritis Gallinarum and Beri-beri," by Major Weston P. Chamberlain and Captain Edward B. Vedder, Medical Corps, United States Army.

During the past year these observers attempted to discover the essential component in rice polishings which prevents polyneuritis gallinarum when the polishings are administered to fowls subsisting on highly milled rice. This subject is of interest, since we believe that when the object of our search is found we will also know the precise substance that should be added to a ration in order to prevent beri-beri. Polyneuritis in fowls and beri-beri in man are practically identical diseases. The etiology of the two diseases is the same, viz., polished rice. At present the symptomatology of the two diseases is identical.

The pathological anatomy of the two diseases is practically identical. Taking our cue from the previous work of Fraser and Stanton, our method of search has been to prepare an extract of rice polishings which would prevent neuritis, and then to further simplify the problem by excluding certain substances. Our original extract was prepared by extracting rice polishings with 95 per cent. alcohol and evaporating this fluid at low temperature until all the alcohol was dissipated. The fats were then removed in a separating funnel and the solution remaining was diluted with water to a bulk corresponding to that of the polishings extracted.

We have also found that the substance which prevents polyneuritis gallinarum is soluble in cold water and in cold 95 per cent. alcohol, and is insoluble in ether; that it is dialyzable and is absorbed by animal charcoal or bone black; and that a decoction of the ordinary white bean will prevent the disease when given to fowls subsisting on polished rice. Furthermore it seems probable from our experience that fat cannot be the essential element since our extract is a watery solution containing no fat, while an ether extract of rice polishings, containing a large quantity of fat, has failed to confer protection.

Our efforts to determine the exact nature of the neuritis-preventing substance have so far proved unsuccessful.

The authors reported an observation which they consider of great therapeutic importance, and which they believe finally disproves the intoxication and infection theories of the causation of beri-beri.

There is in the Philippines a very common disease of infancy called in the native dialect *taon*, *taol* or *suba* which several observers have considered to be infantile beri-beri. It is identical with the disease first described by Hirota as infantile beri-beri, and as the result of our own studies we are convinced that this disease of infants is beri-beri. Assuming this belief to be correct, it occurred to us that infantile beri-beri should be cured by the same simplified extract of rice polishings which we have found to prevent polyneuritis when administered to fowls subsisting on highly milled rice, and also to cure that disease in fowls that have been permitted to develop it.

We tested this theory by treating with the extract fifteen cases of infantile beri-beri, in which the diagnosis was established. *All of these infants con*

tinued to take breast milk alone while under treatment. A brief description of these cases is as follows:—

The mothers have all had symptoms of incipient or marked beri-beri. In the more advanced cases œdema and rather marked paraplegia were present. A number of these mothers have previously had infants die with symptoms similar to those presented by the children which were brought to us.

The children have all been breast-fed, and with one exception have been under three months of age. The disease has usually been ushered in with vomiting, which was followed after a few days by great restlessness, sleeplessness, continual whining, and later by dyspnœa, increased cardiac action and œdema of the face and legs. Later still oliguria and aphonia developed in many of the patients. About half the cases we treated have had aphonia, and some appeared to be at the point of death, while, on the other hand, several cases were much milder. The above is not intended as a complete clinical history, but merely as an indication of the class of cases we have treated. Experience has shown that the majority of infants suffering from infantile beri-beri die if they continue to suckle their mother, but recover if placed on cow's milk.

The infants treated were all given 20 drops of the extract of rice polishings every two hours, while awake, *and continued to suckle the mother.* The results have been truly marvellous. Improvement is immediate. The vomiting stops in twenty-four or thirty-six hours. The child, who has not passed any urine for several days, urinates five or six times a day freely. The œdema disappears in the course of a few days.

It can be said that this extract is a "cure" in the true sense of the word, just as lime juice is a "cure" for scurvy, and that it acts with as great promptitude as does fruit juice in infantile scorbutus.

We believe that the greatest part of the mortality among breast-fed infants in the Philippines is due to beri-beri. Provided this is the case, our extract, which cures the children so promptly, *while they are still permitted to suckle their mothers,* will become of the utmost value in reducing the high infant mortality in the Philippines and in other tropical countries where similar conditions obtain.

Although we have not yet had an opportunity for a trial, it seems probable that the extract will be equally efficacious, in larger doses, against adult beri-beri.

(II) "Observations on Beri-beri in Shanghai," by C. NOEL DAVIS, M.B., B.S.Lond., D.P.H.Camb., Assistant Health Officer, Shanghai.

In concluding his remarks Dr. Davis stated his observations tend to show that beri-beri is an infectious disease. Facts in favour of this view are: (1) That strong healthy people are frequently attacked. (2) That the disease is so markedly an institutional one, occurring where there is an aggregation of potentially infective units. (3) That the disease undergoes periodical fluctuations and has a seasonal incidence. In Shanghai the maximum is usually at the end of the summer. Finally, that infection occurs not by contagion (intimate contact), for hospital attendants and coolies in beri-beri wards have never in our experience contracted the disease; but indirectly from man to man, through the medium of body parasites—notably bugs.

The observations here recounted have a definite bearing on ætiology and are full of suggestion for research work in the future,

"May we not justly hope and believe that with the complete elucidation of this problem will come an adequate method of prophylaxis, so that this disease, which involves so great a sacrifice of human life and entails such serious economic loss, will be successfully combated?"

(III) "Beri-beri, with a suggestion for Governmental Aid in its Eradication," by VICTOR G. HEISER, M.D., Director of Health for the Philippine Islands.

As a means of preventing the use of polished rice in the Philippines it has been proposed to place a tax of say five centavos (approximately five cents Mexican) per kilo upon every kilo of rice that is polished, and no tax upon unpolished rice. The standard by which a rice is to be judged should be definitely fixed by law and can be well based upon the amount of phosphorus pentoxide which it contains; in other words, a rice that contained 0·4 per cent. of phosphorus pentoxide, or more, would be regarded as an unpolished rice, and rice that contained less would be regarded as polished rice. Such a standard would be very simple of application, and would not be likely to cause serious misunderstandings. It would also have the additional advantage of providing definite testimony with which to go before the courts in the event that judicial action became necessary. In view of the fact that the quantity of rice consumed by those who use the European diet is merely nominal, such a tax placed upon polished rice would scarcely be felt by them, and would not be likely to result in any opposition, whereas the masses would almost be compelled to purchase the untaxed rice. Such a law would cause no hardship, and at the same time would provide a final and conclusive test of the correctness or the incorrectness of the predominating view with regard to the ætiology of beri-beri. It is also capable of being effectively and economically enforced.

This plan seems so feasible, however, that the writer desires to recommend to the Association that a suitable resolution be drafted for the purpose of bringing it to the attention of the Governments in the Orient. It is believed that such a measure would be entirely practicable, aad would be almost sure to result in an enormous reduction in the beri-beri mortality and morbidity in a few years time, and it is not too much to hope that the disease may be entirely eradicated in the near future. If such a result as this could be brought about it would add another great triumph in modern prophylactic medicine.

(IV) J. LEGENDRE, M.D., Hanoi, related the following experience:—

Contrary to the opinion of those who see in white rice (stripped of its pellicle) the cause of beri-beri I will relate the occurrence of an epidemic in Chen-tu

(Sze-Ch'uan) among the apprentices in a professional school. I observed about a dozen cases, three terminated fatally; symptoms undoubtedly those of beri-beri.

In that far western Chinese province white rice is practically unknown; rice is unhusked in elementary mills, which leave the greater part of the pellicle attached to the grain.

One case of beri-beri was observed in a professional school, where no such disease had been noticed, through the mingling of ordinary patients with beri-beri ones in a crowded hospital.

An apprentice was coming daily, to have an abscess on the arm, which I had incised, dressed. Every day he came in contact with beri-beri patients; this disease developed in that child fifteen days after the healing of his abscess. Similar cases having been noticed by various authors, it is necessary to relate them in order to throw more light on the obscure cases of beri-beri.

(V) "Beri-beri and the Polyneuritis of Fowls," by L. BRÉAUDAT, Saigon. — In summing up his remarks on this subject Dr. Bréaudat said decorticated rice can sustain animal life, if taken in sufficient quantity and if not acted upon by an anaerobic ferment: the latter produces the morbid phenomena characteristic of beri-beri.

These morbid phenomena can be inhibited by adding paddy, bran, or other substances containing nucleo-proteids to the diet of persons using decorticated rice; the quantity of these substances should increase in proportion to the time elapsed after decortication.

Therefore rice should be used as soon as possible after decortication, or if that is not possible, it should be supplemented by substances rich in nucleo-proteids.

Refuse containing fermenting rice should not be left about kitchens, pantries, &c. Utensils for the kitchen or for serving food should be washed in boiling water.

(VI) Prof. M. Y. TERUUCHI, M.D., Tokio, after discussing beri-beri in Japan, considers that the Schaumann-Nochts phosphorus theory of beri-beri is not sufficiently proved, his own researches and those of other Japanese investigators pointing to a deficiency also in the nitrogen metabolism. Suzuki and Shimamura isolated from the rice bran a highly active anti-beri-beri substance which does not contain any phosphorus and which they consider to be a glycoside. Hirota found that the milk of women suffering from beri-beri has a poisonous effect on the frog's heart, while according to Shimazono the serum of beri-beri patients contains an adrenalin-like substance which causes a contraction of the frog's pupil. The author comes to the conclusion, therefore, that the beri-beri question is not yet settled and that further researches are necessary to a definite understanding of this disease.

(VII) FUTOAHI MAKITA, M.D., Japanese Army, gave an historical survey of the researches into beri-beri which have been carried out in Japan and then proceeded to describe his studies into the relative proportion of the different varieties of white cells in the peripheral blood of patients suffering from beri-beri. He found a considerable increase in the eosinophil cells and also of the lymphocytes. The fact that similar changes are to be found in the blood of chickens suffering from polyneuritis suggests a close affinity between the two diseases. An increase in the tonus of the end-organs of the peripheral nerves may be considered as the cause of these changes. An extract of bullock's spleen was found to have a beneficial effect upon the blood changes in cases of beri-beri.

(VIII) "The Ætiology and Prevention of Beri-beri," by HENRY FRASER, M.D., and A. T. STANTON, M.D. (from the Institute for Medical Research, Kuala Lumpur, Federated Malay States), stated that their work and that of other observers has confirmed the accuracy of the statement first made that beri-beri, as it occurs among rice eaters (that is people whose staple article of diet is rice) is caused by the consumption of overmilled or polished rice, and can be prevented by the substitution of unpolished rice, that is rice from which not more than the skin or pericarp has been removed in the process of polishing. The authors pointed out the difficulty of standardizing rice, as the various constituents of the rice-grain are not distributed uniformly throughout the cells.

Roughly speaking, the central part of the rice-grain is composed of cells filled with starch grains. The cells of the peripheral layers (the subpericarpal layers) are filled with fat; salts and protein are also relatively more abundant in these layers. It is obvious, therefore, that the estimation of any one of these substances would answer the purpose; the one selected must be suited to rapid and accurate estimation, and there must be such a difference in the amount contained in the two kinds of rice as to allow for a reasonable margin of error.

The extraction of fat from rice is a tedious and troublesome process.

The estimation of one or other of the inorganic constituents is to be preferred on account of the relative ease and accuracy with which the determination can be carried out. The authors originally employed the phosphorus-content for this purpose, and in all their subsequent experiments and observations they found it in every way satisfactory as an indicator of the extent to which rice had been polished. A safe or harmless rice, that is one from which not more than the pericarp or skin has been removed in the process of polishing, will invariably yield more than 0·4 per cent. of phosphorus pentoxide, while a dangerous or harmful rice, that is one from which the subpericarpal layers have been removed, will yield considerably less than 0·4 per cent.

Chamberlain and Vedder have recently advocated the estimation of potassium as suitable for standardization purposes.

C. Funk has recently prepared a substance from polishings which is curative to pigeons suffering from polyneuritis and which contains no phosphorus. It may therefore be accepted that a deficiency of phosphorus does not play the important *rôle* which was at one time claimed for it.

Funk has isolated a base which he claims to be the substance the deficiency of which in polished rice is

the cause of beri-beri. His researches have been and are being carried out with great skill, and they add materially to our knowledge.

The use of unpolished rice at all times by these people would prevent the disease occurring among them, but this desirable result will be achieved with difficulty because, to those who have been accustomed to the use of polished rice, unpolished rice has an objectionable appearance. The association of whiteness of food-stuffs with purity has, even in countries other than these, been attended with disadvantageous results.

If it is agreed that some form of legislation is necessary, then in the conditions in which we find ourselves in the Malay Peninsula a tax upon polished rice at the point of distribution appears to offer some advantages.

It is necessary to emphasize the fact that a harmless rice can be converted into a harmful one by an unsatisfactory process of cooking, and energetic action is required in order to secure the cooking of rice in ordinary pots, and to do away with all apparatus in which the rice is cooked by steam under pressure.

In the discussion which followed the reading of the papers the general opinion of those present at the Congress appeared to be that over-milled rice is deficient in a substance which can be measured in terms of phosphorus pentoxide (P_2O_5), and that any rice containing less than 0·4 per cent. of P_2O_5 is capable of producing beri-beri if used as the staple article of diet. As, however, the opinion of the meeting was not unanimous on these points, it was finally held: That "beri-beri is associated with the continuous consumption of white (polished) rice as the staple article of diet."

Discussion on Dysentery.

I.—"Researches in the Multiplication of the Entamœbæ," by Major A. Gauducheau, M.D., Hanoi, Indo-China.

In a paper of considerable interest, Major Gauducheau dealt with the action, the development, the characters, the pathology, and the relations of the entamœbæ to trichomonas. Clinically and experimentally, Gauducheau observed all the intermediate stages between characteristic entamœbæ and trichomonas, and noticed the production of flagellates from branched processes of the trichomonas develop into entamœbæ. He summarizes his conclusions as follows:—

Amœbiasis, either intestinal or hepatic, is the cause of nearly half the deaths of Europeans in Tonkin.

I have isolated and cultivated an entamœba from dysentery of man which multiplies by multiple budding and forming large branched plasmodia.

The adaptation of the parasite to artificial media is difficult and progressive.

The adapted protozoa feed entirely on the cultures of the bacilli of the coli group, on nutritive agar; and form spirochæte-like bodies in culture.

The ectoplasm is clear and forms pseudopodia which may be similar to an undulating membrane.

There are endogenous buds growing in the amœbæ.

In the intestine of man as well as in that of the young dog injected with cultures of entamœba, we find all the intermediate stages between entamœbæ and trichomonas.

We find in the human bowel branched plasmodia from which flagellates are produced, in the same way as amœbæ in cultures.

The flagellate is able to become an amœba.

Our conclusion is the unity of entamœbæ and trichomonas.

Entamœbæ have three stages in their life-cycle: (1) The pathogenic parasite of the tissues; (2) the parasite of bacteria; (3) the flagellate or free stage of the protozoon entirely developed.

The study of the total life-cycle of each species of entamœba must precede their systematic classification.

II.—"An Experimental Study of the Action of Ipecacuanha on Amœbæ," by Captain Edward B. Vedder, M.D., U.S.A., Manila.

It seems probable that the divergence of opinion concerning the action of ipecacuanha in dysentery has resulted partly from the fact that ipecacuanha has been used by some practitioners in all cases of dysentery irrespective as to whether the dysentery was bacillary or amœbic, and partly because of the variability in action of different specimens of this drug. Experiments to determine whether ipecacuanha has any decided action against either the bacilli of dysentery, or such amœbæ as can be cultivated, and to determine to what constituents of ipecacuanha this action is due are here recorded.

The conclusion drawn from these experiments was that 2 per cent. fluid extract of ipecacuanha inhibits the growth of dysentery bacilli, but that this was not a specific action since ipecacuanha also inhibited the growth of other bacteria, and other drugs such as hydrastis and digitalis were quite as powerful as ipecacuanha in inhibiting dysentery bacilli.

It has been found that *Bacillus dysenteriæ* is not inhibited by fluid extract of ipecacuanha in 1 per cent. dilution or less. It seems apparent therefore that this drug can have no specific action in this form of dysentery. That the drug is capable of effecting a cure in bacillary dysentery through its stimulating effect on the intestinal mucosa has been asserted vigorously by some clinicians, but such action while not at all impossible appears rather problematical.

It should be noted however that there was a wide variation in the activity of these different preparations. This naturally suggests that to obtain the best results in the treatment of amœbic dysentery, the best ipecacuanha must be used and the question is at once raised, how can the best preparation be selected? This question of the power of ipecacuanha to kill *amœbic coli* can only be answered by determining the ingredients in ipecacuanha that are actively poisonous to amœbæ, a problem which is difficult because of the complex chemical nature of this drug and the difficulty of obtaining its different constituents in a chemically pure state. It was thought possible that since emetin was proved to be exceedingly active, killing amœbæ in dilutions of 1—100,000, an idea as to the value of a given preparation of ipecacuanha might be obtained

from an analysis showing the total alkaloids contained. This however was not satisfactory. In a series of four experiments, ipecacuanha No. 1 contained 1·80 per cent. total alkaloids and killed amœbæ in dilution of 1—10,000. Ipecacuanha No. 2 also killed amœbæ in dilution of 1—10,000, but only contained ·885 per. cent. total alkaloids, while ipecacuanha No. 4 which killed amœbæ in dilution of 1—20,000 contained 1·60 per cent. total alkaloids. Ipecacuanha No. 4 was therefore twice as active as ipecacuanha No. 1, although it contained less than half the quality of total alkaloids possessed by the latter. It was then suggested that this difference in activity might be due to the different proportions of the two alkaloids, emetin and cephælin, contained in a preparation.

Very little is known about the therapeutic action of the pure alkaloids and other constituents of ipecacuanaha. Text-books on therapeutics very generally agree in assigning the active emetic properties of the drug to the alkaloid emetin. This alkaloid as generally obtained in the market however is in reality not the pure emetin but a mixture of alkaloids, and it is probable that the experiments on which the statements in the text-books are based were performed with this mixed alkaloid. The chemists, Sharp and Dohme, claim that emetin is the expectorant alkaloid and cephælin is the emetic alkaloid of the drug. We have obtained a partial verification of this statement. We were supplied with emetin consisting of mixed alkaloids and pure cephælin hydrochloride from Merck and Company. These alkaloids were tested on a small dog as follows: Varying doses of the emetin were given to the same dog on different days concealed in a small bit of meat. The dog never vomited and did not appear to be seriously inconvenienced in any way although as much as 0·5 gr. was given in a single dose. The emetic dose of this alkaloid for a man is 0·005-0·01 according to Merck. On another day 0·100 gr. cephælin hydrochloride was administered to the same dog with the result that violent vomiting began in about half an hour and lasted for several hours. Merck and Company state that cephælin is preferable to emetin as an emetic. These facts lead us to hope that possibly pure emetin may possess amœbacidal properties without being especially active as an emetic, while it is also probable that there is some other constituent of ipecacuanha which kills amœbæ without possessing any emetic action. If this can be demonstrated we will have at our command the ideal drug for use in amœbic dysentery; a drug that may prove as satisfactory as is quinine in malaria.

Dr. J. Herbert Sanders (Hongkong), said he had successfully treated some cases of amœbic dysentery by the preparation of *ipecacuanha sine emetin*.

(III) "The Surgical Treatment of Dysentery." By OSKAR MÜLLER, M.D., Hongkong.

Dr. Müller said we meet with cases of dysentery of a chronic or gangrenous character where even the most energetic treatment terminates in death or permanent invalidism. These are the cases we can now save by the more active surgical treatment, and I am sure that in a short time the surgical treatment will become more and more popular to the practitioner in the tropics and that appendicostomy—for this is the operation I refer to—will be the typical and only treatment in cases where other measures have failed.

Many surgeons, Weir, Holt, Tuttle, Harriek, Ewart, Dawson, Keetley, Cantlie, and others, show the great superiority of appendicostomy in certain cases compared with the results of the internal treatment.

Dr. Müller related four cases of dysentery in which he had done appendicostomy.

In two cases of amœbic dysentery the appendix showed signs of chronic inflammation and amœbæ could be found easily in the slime taken from the mucous membrane of the removed part of the appendix.

The third was one of acute bacillary dysentery, and but for appendicostomy the patient would certainly have lost his life.

The fourth case belongs to the chronic form of bacillary dysentery, and to tell the truth the result was not so satisfactory as in the other three cases. A ship's engineer, aged 22, first attack of dysentery in Saigon, in May, 1910, with violent pains and frequent stools. His condition was changing in the course of time according to the diet. The slightest mistake in the food made him worse. He was admitted to hospital on April 8, 1911, when he had lost over 25 lb. in weight. Patient was looking very ill, pale, six to ten abominably stinking stools were passed daily, accompanied by heavy distressing feelings in the abdomen. The stools were purely blood with Shiga-Kruse bacilli and no amœbæ. There was no appetite and no fever. After a week's internal treatment with bolus alba, diet, irrigations *per rectum*, &c., there was no improvement. Therefore appendicostomy was done on April 19, 1911. No complications by the appendix. A week after the operation the first partly formed stool was passed. The following day he got from a fellow-patient bread and cabbage to eat which caused a collapse in his condition with more frequent and watery stools, but about eight days later the stools were normal again, once a day formed and without any mucus or blood. In spite of the normal action of the colon, and of the increased diet and his good appetite, the patient had gained only 3 lb. when he left the hospital. Why he did not increase more in weight, I cannot account for. I did not hear again from this case so far.

To resume, in the first case of amœbic dysentery the operation saved what was left of the mucous membrane, spared the patient the misery of a useless and strictured colon, or of perhaps an artificial anus and made the man fit again for his work. The same result was secured in the other case of chronic amœbic dysentery. Perhaps these two patients also escaped the dangerous complication of liver abscess by the operation. In the case of acute bacillary dysentery the operation was without question a life-saving one. In the fourth case, one of chronic bacillary dysentery, the patient was entirely cured of his chronic internal trouble.

All cases, however, show that by this absolutely safe and simple operation a good result could be

secured at a time when the ordinary treatment was at a total loss. It does not make a great difference which remedy we use for the irrigations—collargol, quinine, and tannigen: the local cleaning and washing of the infected part is the most important point.

Annotations.

The Quantitative Estimation of Indol.—Harald Seidelin, *Journal of Hygiene*, April 8, 1911, vol. xi, No. 1, pp. 117-120. Working in Yucatán, Mexico, the author observed that indican could be demonstrated in nearly all urines examined and that a considerable quantity was frequently present.

He caused an investigation of the indol-producing power of different *B. coli* strains to be made and prepared for this purpose a colorimetric scale for the quantitative estimation of indol.

It would be interesting to know whether similar observations as to the excretion of indican have been made in other tropical countries.

Pellagra in the British Isles.—Although the fact does not seem to have been brought prominently forward, pellagra has been known in Scotland for some time. Dr. George M. Miles, in his book, "Pellagra, an American Problem," published by W. B. Saunders Co., 1912, quotes two cases, one reported by Drs. Brown and Carruthers, Rock Ferry, Scotland, and another by Drs. R. Dods Brown and Cranston Low, of the Edinburgh Royal Asylum.

The next sentence in Dr. Miles's book, "Pellagra has evidently failed to find congenial soil in England," is now known to be incorrect, and one awaits the publication of this fact with interest.

The presence of pellagra in the British Isles scarcely harmonizes with the "damaged maize" theory as the causative agent of this disease.

Pellagra in Illinois.—In the *Archives of Internal Medicine* (vol. x, No. 3, September 15, 1912), the Illinois Pellagra Commission conclude their condensed report on that disease. The relation of simulia to pellagra, hypothecated by Sambon, finds but little support from the researches they have been able to make. The particular variety of fly, *S. reptans*, which Sambon claims to be of world-wide distribution, is said to be unknown in North America, except in Greenland. On the other hand, as regards the relation of maize to the disease, all the work done by them has yielded uniformly negative results. They bring forward certain conclusions, purposely expressed in somewhat general terms, which they believe may be useful as regards the further study of the disease. These are as follows:—

"(1) Pellagra is a disease due to infection with some living micro-organism.

"(2) A possible habitat for this parasite in man is the intestinal canal.

"(3) Deficient animal protein in the diet may constitute a predisposing factor in the contraction of the disease.

"(4) The number of cases of known pellagra renders this disease a decided menace to the public health of this state.

"(5) Careful search for, and investigation of, suspected cases outside the state hospitals for the insane is extremely desirable in view of experience elsewhere."

Trypanosomiasis in Game in North-Eastern Rhodesia.—Kinghorn and Yorke write in the *Annals of Tropical Medicine and Parasitology* (series T. M., vol. vi, No. 3 A.) on the "Trypanosomes infecting game and domestic stock in the Luangwa Valley, North-Eastern Rhodesia." They find that such parasites are of frequent occurrence in game and domestic stock in the Luangwa Valley, at least 37.5 per cent. of the buck being infected. Six species of trypanosomes were found, *viz.*: *Trypanosoma rhodesiense*, *T. vivax*, *T. nanum*, *T. pecorum*, and two others, of which one was possibly *T. montgomeryi*. In a natural state *Glossina morsitans* transmits two of these trypanosomes, *viz.*: *T. rhodesiense* and *T. pecorum*, and probably also *T. vivax* and *T. nanum*. Circumstantial evidence also exists that *T. pecorum* may be transmitted by biting insects other than tsetse-flies. In a further paper published in the same number of the *Annals*, Kinghorn and Yorke reach the conclusions that *T. rhodesiense*, *T. pecorum*, *T. ignotum*, and probably also *T. vivax* and *T. nanum*, are transmitted, in nature by *Glossina morsitans* in the Luangwa Valley.

Blackwater Fever.—Woldert, of Texas, describes his microscopic findings in twenty-four cases of malarial hæmoglobinuria (*New York Medical Journal*, September 28, 1912). In his series of twenty-four cases, the blood was examined in twenty-one. In all instances it was examined *after* the development of hæmoglobinuria. Malarial parasites were found in the blood in only two cases, while in two additional cases their presence was doubtful. In the two cases in which the parasites were positively found, both were of the æstivo-autumnal variety. In one of the cases the intra-corpuscular ring form of the parasite was present, and the specimen showed the greatest number of parasites the author has ever seen in any case of malarial fever. In this case perhaps one-third of all the red corpuscles were infected, some red cells containing as many as three parasites each. The patient recovered. In the other case one ring form parasite within the cell and a flattened merozoite attached to the outer rim of the corpuscle were found.

The author finally states that, having had practical experience of fourteen years in a district in East Texas, where malarial fever is more or less common, and having given this subject special study during that time, he feels warranted in making the general assertion that the occurrence

of malarial hæmoglobinuria (blackwater fever) goes hand in hand with the prevalence of malarial fever, and when malarial fever disappear blackwater fever also disappears.

This, of course, is what is found in other parts of the world, and is not a new discovery.

Multiple Echinococcal Infection of the Abdominal Viscera.—Tirumurti, in the *Indian Medical Gazette* for August, 1912, describes a case of multiple hydatids of the abdominal viscera. The patient complained of swelling of the abdomen, pain in the pit of the stomach, pain round the umbilicus, and difficulty of breathing. The diagnosis was made when the abdomen was opened at an operation, an enormous cyst being found which completely filled the abdominal cavity, extending from above the front of the spleen and liver right down into the pelvis below and to the flanks on either side. The patient eventually died, and at the autopsy no fewer than 500 cysts of sizes varying from that of a pea to an orange were found. In addition to the large primary cyst there were smaller cysts in the liver, spleen, mesentery, omentum and peritoneum; the stomach, spleen, intestines, lungs, heart and kidneys were free. The walls of most of the cysts were thin and transparent, but some had thicker translucent walls, while a few had firm, thick, white, fibrous, smooth walls, resembling the shell of a hen's egg in appearance. The contents were generally clear and transparent, no suppuration was noted, and in some hooklets and scolices were found.

Dr. Tirumurti is of the opinion that the primary cyst first developed in the hypogastric region in front of the peritoneum covering the anterior abdominal wall, and gradually increased in size. Subsequently, by repeated fresh infections, vesicles appeared in the spleen, liver, and other viscera. Clinically, hydatid disease of the abdominal cavity is often mistaken for extra-uterine gestation, ovarian cysts, cystic renal disease, and other abdominal tumours. As Tirumurti says, the possibility of hydatid disease should always be borne in mind.

The So-called Parasite of Yellow Fever.—Agramonte, in the *Medical Record* of August 17, 1912, contributes an additional note upon a so-called parasite of yellow fever (Seidelin). He (Agramonte) now states that bodies similar in size, colouring, and general appearance to those described by Seidelin in yellow fever, can be demonstrated in other pathological conditions as wide apart as measles, ankylostomiasis, typhoid fever, severe icterus (Weil's disease), and urticaria. In other instances, even in some of the conditions just mentioned and in a case of yellow fever from Bahia (Brazil), prolonged examinations failed to demonstrate them. Agramonte, therefore, believes that these bodies are nothing but nuclear and protoplasmic fragments, chromatoid and basophilic elements, this explaining their dissimilarity of size and form even when found in the same drop of blood. Cartaya has also found similar bodies in a case of human glanders in the Las Animas Hospital Laboratory, Havana, and both he and Guitéras, who examined the films, are of the opinion that these appearances are the same as those shown to them by Seidelin in his preparations last winter.

Agramonte also mentions Schilling's paper, where Seidelin's bodies are also adversely criticized, and says that many of the drawings of these blood elements given in that paper are as much like Seidelin's "parasites" as any two fragments of anything that cannot be mathematically broken up can be. He thinks that the parasites must be dropped therefore.

An Iron-Hæmatein Stain; with Remarks on the Giemsa Stain.—Harald Seidelin, *Parasitology*, July 18, 1911, vol. iv, No. 2, pp. 94-103, one plate. A good staining of trypanosomes in sections by Heidenhain's iron-hæmatoxylin method is always difficult and occasionally impossible to obtain when the parasites are enclosed in compact masses of alterated blood. The present method, which is a modification of Weigert's iron-hæmatoxylin stain, has given excellent results where the techniques ordinarily employed failed entirely. It is, moreover, very quick and obviates differentiation, an important feature, as artefacts are more likely to occur when a preparation is first overstained and afterwards decolorized. The method has proved useful in the staining of trypanosomes and other protozoa in sections, and can also be applied to blood and other films after wet fixation. Histological details are remarkably well defined, and the stain combines well with counter-stains, as eosin and acid fuchsin-picric acid.

Two solutions are required: (*a*) A 1 per cent. solution of Grubler's hæmateinum purissimum in 96 per cent. alcohol, prepared without heating; and (*b*) Weigert's iron-perchloride solution. Three parts of *a* and two parts of *b* are mixed and left for not less than fifteen minutes and not more than two hours before use. Stain five to ten minutes, wash in tap water and prepare in the ordinary way for mounting.

In the second part of this paper prescriptions are given how to obtain good results by Giemsa's method for the staining of sections and wet films.

The Treatment of Leukæmia with X-rays.—Stengel and Pancoast, in the *Journal of the American Medical Association* (September 28, 1912), write on the treatment of leukæmia and pseudoleukæmia with X-rays. They believe that the radiation should primarily be directed to the bones, and claim the following advantages for this method: (1) The expectation of life is greater; (2) the patients, as a rule, regain health and strength more rapidly; and (3) there are fewer dangers from toxæmia and X-ray dermatitis. Special emphasis is required to be laid on some of the details in the author's method.

(1) The applications should be made systematically to the bones of the entire body, with the exception of the head, the body being mapped out into definite areas for the purpose.

(2) Exactness in dosage is always most important. It should be so regulated as to produce the necessary effect without inducing toxæmia.

(3) The frequency of the applications is equally as important. They should be made daily when possible, and prolonged periods of rest should not be permitted.

(4) Direct exposure of the spleen and other secondary enlargements should be carefully avoided during the earlier part of the treatment; this applies especially to the very large spleens of the myelogenous form of the disease. The first important reason for this is the avoidance of the undesirable toxæmia that is likely to follow, especially in advanced toxic cases; and the second is the fact that the more rapid decrease in the leucocytosis that is likely to follow is apt to be misleading because it is not due to the effect of the radiation on the primary seat of the disease entirely. In many instances this will lead to a discontinuance of the treatment long before the greatest possible inhibitory effect on cell-proliferation has been induced. The spleen and other enlargements should receive a share of the applications by all means, but always at a later and safer period, when the leucocytosis has diminished considerably and the general condition improved to such an extent that the additional waste products can be taken care of adequately and eliminated without any danger from toxæmia. The spleen should not be treated at the expense of the bones, but should be included as an additional region to receive its share of the applications in its turn. In the case of enormous spleens it is advisable to begin their radiation at the earliest period consistent with safety, because their reduction requires a long time. Moreover, a large spleen is a source of much discomfort because of its size, weight, and effect on other organs, and its presence is a source of occasional dangerous complications, such as perisplenitis or hæmorrhage resulting either spontaneously or as a result of traumatism, as from a fall.

(5) The duration of the treatment has an important bearing upon the prolongation of life. Applications should not be discontinued or lessened in frequency until normal conditions prevail. By "normal conditions" is meant the appearance of every manifestation of the disease, including abnormalities in the differential count.

(6) The leucocyte count may be an important clinical factor in showing the patient's condition, and is perhaps the most direct single index one has as to the effect of the treatment on the disease, but it is by no means so dependable in the latter application as it is generally regarded. In fact, it should not be relied on to any extent as a direct index, except at practically one stage of the treatment. If one is able to reach the point where the leucocyte count has subsided to normal or nearly normal figures, the differential count becomes more and more important as the guide for continuing or stopping the application.

Blood-examinations should be made frequently throughout the treatment, and especially leucocyte-counts. As a rule the leucocytosis is apt to increase to a certain extent for a while after beginning radiation of the bones, but this should never be regarded seriously unless accompanied by increased toxæmia, or unless the general condition becomes worse. A normal leucocyte count is never, in itself, an indication to stop, but treatment should be continued as long as myelocytes are present, or the differential count remains distinctly abnormal. After a restoration to normal percentages, treatment may be discontinued; but a differential count should be made subsequently at least once a month, and, on the return of distinctly abnormal percentages, radiation should be resumed immediately, without waiting for the appearance of any other manifestations of a relapse. This is one of the secrets of prolonging life in the most favourable cases. Arsenic should be avoided particularly at such times, as it tends to delay the appearance of the first signs of a relapse and the needed radiation.

(7) Arsenic is frequently a valuable adjunct to radiation, but it is too often misused. If radiation is to be regarded as the essential therapeutic agent, and there are no special indications for giving arsenic, it should be used with careful reservation, as it is likely to interfere seriously with the proper and adequate administration of the X-ray treatment. It should never be given in large doses during radiation. If for any reason the patient is obliged to discontinue the X-ray treatment for any considerable period of time, arsenic should, of course, take its place.

(8) Particular attention should be paid to the care of the skin from the very beginning, as the ultimate result or the duration of life, at least, may be largely dependent on the tolerance of the integument. A severe X-ray dermatitis always demands a cessation of treatment over a portion, or all, of the body, and this may be of sufficient duration to shorten the life of the patient a year or more.

Adequate X-ray filters should always be employed, and the applications made through the clothing as an additional precaution. The quality of the output of the X-ray tube should also be carefully watched. A dermatitis is far more likely to appear during the summer months. Whenever the skin begins to show a reaction alcohol bathing should be advised, and talcum or stearate of zinc dusting-powder should be freely used, especially where skin surfaces are in contact or the clothing produces friction. It is well to give additional protection to the hands, which are not covered by clothing, and to protect the hair of the head and the external genitalia of males by lead screens.

(9) Radiation is contra-indicated in practically all cases of acute leukæmia, as it will only hasten death. The same may be said of many chronic cases during acute stages with associated severe toxæmias, although considerable benefit may be derived from the treatment of some of these cases. The dosage should be much reduced at the start, and the applications should be limited to the extremities until there are some definite signs of improvement. If the condition appears to become

distinctly aggravated by the treatment, this should be discontinued; but if there seems to be any improvement, or even if the case appears to be made a trifle worse, radiation should be continued, and the dosage gradually increased with care, but kept within safe limits. To accomplish any good, this early toxic period must be passed over as soon as possible, and without intermissions unless absolutely necessary. In these grave cases it is a question of life or death, and many such patients have been allowed to die too soon for fear of doing harm before any harm has been done. The authors have carried several patients safely over such periods, even when others have hesitated or declined to treat them, and some of these patients are now alive and attending to their daily occupations.

(10) Of all the patients who have responded in any way favourably to treatment, the authors have found that those of lymphatic type give somewhat better ultimate results than those of myelogenous type.

This very valuable paper should be carefully studied by all who may have to treat cases of leukæmia. Attention to many of the points mentioned may make all the difference between success and failure.

Abstract.

ETIOLOGY OF PELLAGRA.

Amongst the many causes assigned for the appearance and spread of pellagra in the United States of America one of the most recent is that advanced by Dr. M. L. Ravitch, of Louisville, Kentucky. The paper was read at the Section on Dermatology of the American Medical Association, June, 1912, and published in the *American Medical Association Journal* of July 6, 1912.

Shortly stated, Dr. Ravitch's observations are as follows: He believes that the most probable cause is the transmission of pathogenic trypanosomes by the migrating birds, particularly blackbirds. He associates the presence of pellagra amongst human beings with a pellagrous-like disease amongst horses and cattle, and in this connection quotes observations by Dr. Pardy and Eisenman. These observers state that meningeal symptoms, resembling blind-staggers, developed in a small number of a group of horses which had been given "supposedly" spoiled corn in shucks, and they concluded that the horses died from a disease similar to that caused by *Trypanosoma equinum*, and that the blackbirds might have been responsible for it. It is asserted that in the last few years where pellagra prevailed, blackbirds and other migratory birds were present in unusual numbers, and it is assumed that their passages northwards in spring, and southwards in the autumn, accounted for the seasonal (spring and autumn) recurrences of pellagra symptoms in human beings.

Dr. Ravitch concludes by stating that the cause of pellagra and the pellagra-like disease among horses is that the blackbird and a few other migratory birds are the media of infection; that the transmission of this disease to human beings and animals is probably accomplished by bites of mosquitoes and flies; and that the ingestion of the cysts deposited in the fæces of these insects on plants brings about infection in man.

The discussion that followed upon Dr. Ravitch's paper showed that the present tendency of belief is to doubt the Zeist theory of the origin of pellagra.

Notes and News.

UNIVERSITY OF LONDON, KING'S COLLEGE, AND CHARING CROSS HOSPITAL MEDICAL SCHOOL.

Departments of Bacteriology and Public Health.

More accommodation has for some time been urgently needed in the departments of Bacteriology and Public Health. This has now been provided, with the sanction and approval of the University, by the removal of these departments with their staffs to 62, Chandos Street, Strand, W.C. (Charing Cross Medical School Buildings), where an excellent suite of laboratories is at present vacant owing to the transference of the Charing Cross Medical School's preliminary and intermediate medical studies to King's College. The laboratories at Chandos Street are being altered and refitted, and the accommodation there provided will comprise a large class laboratory, research laboratory, professor's laboratory, and lecturer's laboratory for each department, bacteriology and public health respectively, a photomicrographic laboratory, preparation and animal rooms, a large theatre, office and library for the joint use of the two departments. There will be regular courses of instruction in bacteriology, clinical pathology and photo-micrography, and for the diploma of Public Health. Research and investigation work for public bodies and others will also be carried on as before. The new laboratories were opened on October 1. The laboratories vacated at King's College by this removal will be utilized for increasing the accommodation for the preliminary and intermediate medical studies.

French Hospital at Fez.—The French have instituted a hospital at Fez. With meagre financial support Dr. Murat has laboured successfully, and no fewer than 32,000 out-patients were treated during 1911, whilst the twenty hospital beds were highly appreciated by the natives. Typhoid fever, malaria, dysentery, and small-pox were the prevalent ailments. The town of Fez is watered by the River Oued, which, pure at its source, becomes polluted by the sewage from the several villages on its banks. Throughout the plains many swamps border the river, and the prevalence of both typhoid and malaria are readily understood. Vaccination

against small-pox is not yet compulsory, so that the disease, having full scope, prevails to an alarming extent.

INDIAN RAILWAYS.—During 1910 and 1911 there were only three deaths due to failure of rolling stock, permanent way, &c. These fatalities occurred amongst railway servants. No passengers were killed during these years by railway accidents. Considering the enormous mileage of railway in India, the safety of railway travelling in the country reflects great credit on all concerned.

PAPAYA, OR PAWPAW.—R. C. R. Owen, the Governor of the Mongala Province, Sudan, states that papaya is extensively cultivated in the province, where the fruit is known as pawpaw; it is regarded as a potent digestive, and a joint of meat or chicken wrapped up in the leaves for two or three hours before being cooked is rendered quite tender.

Medical Notes.

Ipecacuanha in its Wild State.—In Colombia ipecacuanha is found in its wild state as a trailing plant along the banks of rivers. It thrives best in clay soil, but although it requires a great deal of moisture, it cannot live under water, and consequently in Colombia it is found in its best development in regions where the rainfall is abundant, but where the rivers do not overflow. The Sinu River is the ideal region for ipecacuanha. The plant is found in abundance from near the headwaters of this river to near the city of Monteria, about sixty miles from the coast, where the clay formation, which ipecacuanha seems to demand, stops, and below which point the river is subject to periodical overflows. The growth extends to several miles on each side of the river, and also to the more important tributaries of the Sinu, the Esmeraldas, Verde and Manso Rivers. In regions where the water is excessive, such as the valley of the Atrato, the plant, though found, has a poor growth and is of an inferior quality. In gathering ipecacuanha the whole plant is uprooted and the thin and soft rootlets are thrown away, and these discarded rootlets serve for reproduction, becoming in a year well-developed plants with valuable roots of their own.

Malaria in Alabama.—In the State of Alabama, U.S.A., during 1911, of 70,000 cases of malaria reported 770 persons died. The economic loss to the state thereby is estimated at half-a-million sterling for one month only. The necessity for anti-malarial measures is brought home by these figures to even the most casual observer.

Plague in Liverpool.—The cure of plague reported from Liverpool in August, 1912, was treated with plague serum and recovered. It is interesting to note that the patient, a boy, when sent to hospital was believed to be suffering from appendicitis.

Salol-coated Ipecacuanha Pills in Dysentery.—The administration of ipecacuanha in dysentery in salol-coated pills has not been found satisfactory. If sufficiently coated to prevent their dissolving in the stomach it happens that they are passed as ingested in the fæces; if, on the other hand, they are but lightly coated, the pills burst in the stomach, and the object for which they were given, namely, the prevention of vomiting, remains unfilled.

Drugs and Appliances.

PULTICINE has been prepared by Oppenheimer, Son and Co., to supersede the ordinary linseed meal poultice which is so universally condemned. It is readily applied, is antiseptic, and may be kept in place for from twelve to twenty-four hours—a great advantage.

An "aseptoid spray" apparatus is supplied by Oppenheimer, Son and Co., 179, Queen Victoria Street, London, E.C., at the moderate cost of 3s.

UZARA, an intestinal sedative, is prepared from the root of the Uzara plant, a South African shrub belonging to the family of the Asclepiadaceæ. It has been used in dysentery, dysmenorrhœa, and chronic intestinal catarrh, &c.

Personal Notes.

COLONIAL MEDICAL SERVICES.

West African Medical Staff.

Death.—E. H. Read, M.R.C.S.Eng., L.R.C.P.Lond., L.S.A.Lond., Senior Medical Officer, Southern Nigeria.

No Transfers.

Retirement.—W. M. Graham, M.B., B.Ch.Dublin, Head of the Medical Research Institute, Lagos, retires on pension.

Resignation.—H. de C. Dillon, M.B., B.Ch., B.A.O.Dublin, L.M.Rotunda, D.T.M.Liverpool.

Promotions.—W. I. Taylor, M.R.C.S.Eng., L.R.C.P.Lond., D.T.M.Liverpool, M.D., C.M.Toronto, Medical Officer, Southern Nigeria, to be a Senior Medical Officer, Northern Nigeria; D. Burrows, L.R.C.P., L.R.C.S.Edin., L.F.P.S.Glas., L.M. & S.Hyderabad, Medical Officer, Sierra Leone, to be a Senior Medical Officer, Southern Nigeria.

New Appointments.—The following gentlemen have been selected for appointment to the Staff:—E. L. Anderson, M.B., Ch.B.Victoria, L.S.A.Lond., D.T.M.Liverpool, Southern Nigeria; T. R. Sandeman, M.B., Ch.B.Edin., Southern Nigeria; E. F. Ward, M.B., B.Ch., B.A.O.Belfast, Sierra Leone.

Other Colonies and Protectorates.

E. Glenny, F.R.C.S., L.R.C.P.Ireland, L.M.Rotunda, has been selected for appointment as a Medical Officer in the Straits Settlements; W. R. W. James, L.R.C.S., L.R.C.P.Edin., L.F.P.S.Glas., has been selected for appointment as a Medical Officer in the Gilbert and Ellice Islands; A. C. M. McHattie, M.B., Ch.B.Edin., D.P.H.Cantab, has been selected for appointment as Chief Medical Officer, Bahamas; H. R. Neilson, M.B., Ch.B.Aberdeen, A. H. Owen, M.R.C.S.Eng., L.R.C.P.Lond., and B. Spearman, M.B., B.C., D.T.M. and H.Cantab, have been selected for appointment as Temporary Medical Officers in Uganda; C. B. Pasley, F.R.C.S., L.R.C.P.Ireland, and K. Simpson, M.B., Ch.B.Edin., have been selected for appointment as Medical Officers in the Federated Malay States; A. D. J. B. Williams, M.R.C.S.Eng., L.R.C.P.Lond., has been

selected for appointment as a Medical Officer in the East Africa Protectorate; H. F. Hardie, L.D.S.Edin., has been selected for employment as Government Dental Surgeon in West Africa; G. W. Royle, L.D.S.Eng., has been selected for employment as Government Dental Surgeon in the Falkland Islands.

Dr. A. H. Bodeker has been appointed Medical Officer of Health, Nairobi.

Dr. William Hume Hart has been appointed a Medical Officer, Grade III., Federated Malay States, and assumed duty on July 28.

Dr. Denis J. F. O'Donoghue has been appointed Medical Officer, Medical Department, Gold Coast, in place of Dr. A. J. Smith, who has resigned.

Dr. A. Robertson has been appointed Medical Officer of Seyidie Province, excepting Mombasa.

Recent and Current Literature.

"Berliner klinische Wochenschrift," February 12, 1912.

The Wassermann Reaction.—The perplexities attending the significance of the positive and negative phases of the Wassermann test continue. F. Müller, in the *Berlin. klin. Woch.* of February 12, 1912, makes the statement that a positive Wassermann phase may be succeeded by a negative which may continue for a year or two; and yet subsequently to this period again become positive.

Salvarsan has been tried in many tropical diseases, amongst others may be mentioned malaria, yaws, acute tropical phagedænic ulcer, Kaposi's disease, as well as in scurvy and leprosy. Of these the best results have been attained in yaws by Strong in Manila; one injection, as a rule, suffices to cure. In malaria where quinine failed, weekly injections of salvarsan are recommended by Weintrrand in an article in the *Berlin. klin. Woch.* of February, 1912.

"Gazetta degli Ospedali e delle Cliniche," Milan, May 21, 1912.

Adrenalin and Allied Preparations in Cholera.—In the belief that cholera is due to adrenal insufficiency, P. Plovesana tried epinephrin in several cases of cholera with some success.

"Annals of Tropical Medicine and Parasitology," July, 1912.

(1) *Variations in Number of Leucocytes and Crescents in Malaria.*—D. Thomson, by injecting dead malaria parasites in cases of malaria, found that it requires an injection of 10 to 20 million dead malignant tertian parasites to cause a leucocytosis, whereas injections of from 30 to 40 million caused a leukopænic effect, similar to that which occurs in a malarial paroxysm.

(2) *Destruction of Crescents.*—D. Thomson proposed two ideal methods of dealing with malaria. (1) On Ideal Method A, Thomson proposes that every member of the community should take quinine daily and simultaneously for three weeks every three months. The dose for adults should be not less than 20 grains of quinine daily, and for children in proportion. Thomson is of opinion that by this method both the sexual and asexual parasites are destroyed. (2) Ideal Method B. After ascertaining by blood examination the malaria-infected persons of a community, only those showing malarial parasites should be condemned to take the three weeks' course of quinine. It is also suggested that those persons in whom crescents are found should be isolated in mosquito-proof hospitals until such time as they are found to be non-infective.

"Journal of the Royal Army Medical Corps," September, 1912.

Sudan Kala-azar.—Captain W. E. Marshall, R.A.M.C., in the *Journal of the Royal Army Medical Corps* for September, 1912, communicates "Further Experimental Investigations into Sudan Kala-azar." Previously (*Journal of the Royal Army Medical Corps*, 1910, xvii, No. 3, and vol. A, 1911, of "Fourth Report of the Wellcome Tropical Research Laboratories, Khartoum) Marshall had shown that this form of Leishmaniasis has the following characteristics: (1) It affects all ages, but is commoner in late childhood and early adult life; (2) the *Cercopithecus sabæus*, the grey monkey of the Sudan, can be infected with the disease by intraperitoneal or subcutaneous injection of the parasite; (3) the parasite grows readily on 10 per cent. citrate, on Novy and MacNeal's medium and on Nicolle's medium; (4) the parasite can be demonstrated in the peripheral blood of the infected in a large percentage of cases.

From Marshall's further experiments he concludes that: Dogs can be experimentally infected with Sudan kala azar from human cases, from infected monkeys, or from other infected dogs; young dogs being more susceptible. The transmission of the disease from dog to dog by means of the dog-flea, the *Ctenocephalus canis* proved negative. Marshall also demonstrated the fact that the Leishman-Donovan body is occasionally present in large numbers in the peripheral blood of human cases.

"Tropical Diseases Bulletin."

It is satisfactory to know that the British Government has resolved to issue a *Tropical Diseases Bulletin*, under the management of the Tropical Diseases Bureau. Dr. A. G. Bagshawe, who has conducted the *Sleeping Sickness Bulletin* so successfully is to be the director, and Dr. G. C. Low will be associated with him as assistant director.

The tropical diseases of animals will be dealt with in the *Tropical Veterinary Bulletin*, which is to be edited by Mr. A. L. Sheather, B.Sc., M.R.C.V.S.

The *Tropical Diseases Bulletin* will consist of about 50 pages, and is to be published twice monthly by Messrs. Baillière, Tindall and Cox. The subscription is £1 1s. a year; individual copies to cost 1s. 6d.

"Journal of the Royal Army Medical Corps," September, 1912.

A Case of Quinine Poisoning.—The Director of the Medical Services in India relates, in the *Journal of the Royal Army Medical Corps* for September, 1912, the case of a soldier who, having a little fever, took two fluid ounces of an "essence of quinine," amounting to about 240 gr. of quinine. The soldier died two and a half hours afterwards. It was not discovered that he was ill until an hour and a half after having taken the dose, and although for an hour afterwards every effort was made to save him, it proved useless. The signs and symptoms present, when he was first seen, one hour and a half after taking the dose were: breathing stertorous, pulse barely perceptible, pupils equal but widely dilated, no corneal reflex, and the body cold and clammy. Comment is made in the paper that no *post-mortem* was made, and that "the actual cause of death in this and other cases of the kind would appear to be exaggerated and acute cell asphyxia, this interference with oxidation involving not only the general tissues, but also those of the higher nerve-centres, particularly the respiratory centre, the failure of which to be able to respond being the true cause of death."

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the Journal of Tropical Medicine and Hygiene should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

POROCEPHALIASIS IN MAN.

By Louis W. Sambon, M.D., F.Z.S.

Lecturer to the London School of Tropical Medicine.

In previous articles (see this Journal, January 15, July 15, and September 1, 1910) I described two interesting Tongue-worms, one *Porocephalus armillatus* belonging to the Ethiopian region, the other *Porocephalus moniliformis* belonging to the Oriental region, both of which are known to occur in man within their respective distributional areas, and I gave for each a list of the cases recorded in literature up to date.

There are three more cases ascribed to *Porocephalus armillatus* which I did not mention, because they could not possibly be due to this Ethiopian linguatulid.

The first one was published by F. H. Welch in the *Lancet* of November 16, 1872, in an article entitled "The Presence of an Encysted Echinorhynchus in Man." In this paper the author describes a minute zoo-parasite found encapsuled in the submucous tissue of the jejunum of a soldier who had been invalided home from Kussowlie for tuberculosis after sixteen years' service, the last fourteen of which had been spent continuously in India. The patient died at Netley Hospital, England, six days after admission.

Welch describes the parasite as follows:—

Description of Parasite.—Fig. 1 represents the animal, *au naturel*, 0.13 in. in length and 0.033 in. in thickness, somewhat reniform in shape, one end rather more bulbous

Fig. 1.

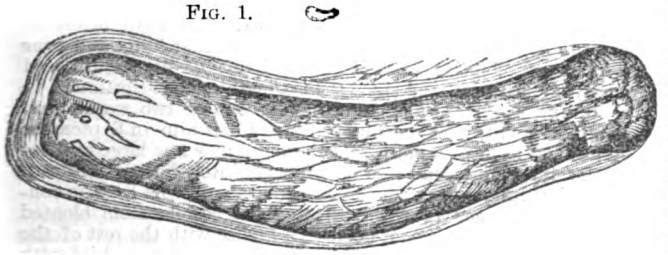


Fig. 2.

than the other, milky white in colour, structure very firm and elastic, with a clearly defined inner line following the external contour. Fig. 2 represents the animal under a magnifying power of 25 diameters, and shows an encapsulating material surrounding the body of the parasite, which was free from it at all points except at the posterior end; this chitinous encircling membrane was transparent, marked by delicate, faint lines, very tough and elastic, and extremely difficult to penetrate with the needle and rupture. The animal consisted of a cylindrical soft body, rather larger in diameter in the centre, the narrowest part preceding the posterior end, which was bulbous, the anterior end being somewhat flattened. At the anterior end, or head, were two parallel lines passing from the centre inwards towards the body and gradually becoming indistinct, suggesting an unfolding of the outer surface, a retractile proboscis. Around this latter were seen a number of hooklets, irregularly scattered over a surface one-seventh the total length of the whole body, the sharp ends generally pointing downwards, and indicating (on the assumption of a retractile anterior extremity) that the major part of the proboscis was exserted. Immediately below the region of the hooklets there was a slight neck-like constriction; over the body generally there were numerous irregular lines showing a

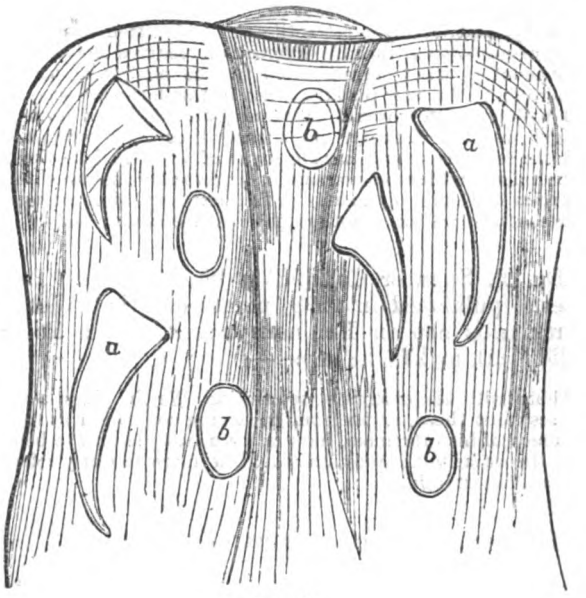


Fig. 3.

wrinkling of the outer surface, and towards the posterior half were dark granular masses—the body contents. There was no discernible differentiation of parts, the posterior bulbous end was in direct contact with the encapsulating membrane, but did not appear to be the seat of aperture or appendage, though on the latter point a certain doubt may be cast, as, in the attempt to clear it up by complete separation of the body from the encircling capsule, the soft tissues of the former ruptured and prevented further accurate examination. Fig. 3 is the anterior end of the animal still further magnified, the presence of a retractile proboscis or head being clearly indicated. Linear striæ observed running parallel to the body, and suggesting muscular layers in connexion with the inversion and eversion of this portion. The hooklets were irregularly dispersed, and either seen in their entirety as at *a*, or merely the disc of attachment as at *b*; not more than nine could be counted, and the appearance favoured somewhat the idea of a triple arrangement in three rows. Fig. 4 shows isolated hooklets of two forms: the one, *a* with a broad base of attachment, and springing from it a very sharply curved claw, very much resembling that of a rapacious bird; the other, *b*, with a narrower base, long, straight limb rising almost at right angles from it, and a sudden curved sharp tip. They were hollow, of a bright amber colour, and contrasted strongly with the dull opalescent aspect of the body generally. The hooklets *a* were in the minority, probably three in number, and were situated at the extreme part of the exserted proboscis.

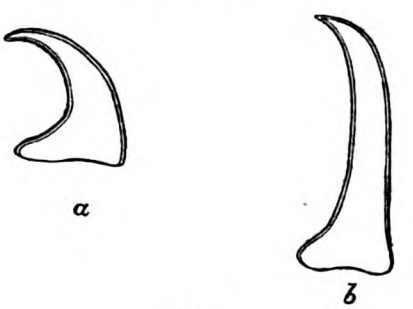


Fig. 4.

Concerning the nature of this parasite Welch says: —

There can be little doubt as to the real position of this parasite amongst the Acanthocephala, being neither provided with mouth nor intestines, but obtaining its nutriment by a vicarious process of imbibition through the general surface of the body, and having a retractile proboscis often termed the head, armed with a variable number of recurved hooks. The absence of distinct segmentation in the elongated body is favourable to the view that the sexes in this form are separate, and both characters would sufficiently distinguish it from the cestoid worms. Moreover no sucker discs were perceptible, and the character and arrangement of the hooklets though seen under considerable pressure, unequivocally shadowed forth a species of Echinorhynchus, for the first time discovered as a representative of the Acanthocephala in the human body.

Dr. T. Spencer Cobbold in his book on "Parasites," published in 1879, points out that Welch's parasite is not an Echinorhynchus, but a linguatulid. At p. 256 he says:—

Along with his elaborate description Welch gives several figures; but these, so far from producing conviction as to the accuracy of his inferences, have unfortunately led me to believe that the parasite in question would be more properly referred to the Pentastomidæ.

Further, at p. 264, he says: —

Lastly, I must again express my belief that the so-called Echinorhynchus, described by Welch, if it be not the *Pentastoma denticulatum* (= *Linguatula serrata*), must either be referred to *P. constrictum* (in an early larval condition) or to some other hitherto undescribed pentastomatoid larva.

Professor R. Blanchard, in his "Traité de Zoologie Médicale," published in 1890, says:—

In Welch's case, undoubtedly the parasite was not a *Linguatula serrata*, but some closely allied species.

Judging from the zoo-geographical region in which infection occurred, the size of the parasite, the cylindrical form of its body, and the number and shape of its hooklets, one might be led to look upon Welch's linguatulid as a very early nymphal form of *Porocephalus moniliformis*, because this Oriental linguatulid is known to occur in man, and because its early forms, like the early forms of other species of tongue-worms, might be provided with caducous accessory hooklets. Unfortunately, the author does not mention the number of body rings, and, therefore, it is impossible to arrive at any definite conclusion. The parasite may have been either a new species, or a specimen of *Porocephalus najæ*, a linguatulid found by Leuckart (1860) encysted amongst the abdominal muscles and on the peritoneum of the Indian Cobra (*Naja tripudians*), or again, unless the two be identical, the one found by Parona (1890) in Blyth's Musk-Shrew (*Crocidura fuliginosa*), and termed by him *Pentastomum crociduræ*.

The irregular, scattered condition of the hooks in Welch's specimen was obviously due to injury during manipulation. Welch states that the parasite was damaged in the attempt to separate its body from the enclosing capsule, and that it was examined "under considerable pressure." The unequal number of hooks mentioned is probably due to the fact that he took the chitin-ringed mouth for a ninth hook, or its "disc of attachment," a mistake which has been made by others, as, for instance, by Humboldt when he described five instead of four primary hooks in *Porocephalus crotali*.

The second case is one very briefly mentioned by Sir William Osler in his "Principles and Practice of Medicine" at p. 376 of the 4th edition, under "*Porocephalus constrictus*." He says:—

In 1869, I saw a specimen which had been passed with the urine by a patient of James H. Richardson, of Toronto.

The escape of the parasite by way of the urethra being more suggestive of a Sparganum than of a linguatulid, I asked Sir William Osler whether he could give me further details about this case, and he told me that the parasite had been determined by Professor Hincks, who believed it to be a specimen of *Porocephalus constrictus*.

The third case was described by Dr. Austin Flint at a meeting of the New York Pathological Society, on December 12, 1876. Being unable to consult the *Transactions* of the Society, I transcribe the case as recorded in the *New York Medical Record* of January 13, 1877:—

Dr. Flint exhibited a specimen of *Pentastoma constrictum* which had been sent to him by Dr. M. M. Campbell, of Albany, Gentry Co., Mo., who furnished the following history: F. R. Robinson, aged 36, farmer by occupation, who served three years in the army during the war, applied to me in September last for examination, with the following story: Said that he had been very bad with an acute attack of pleurisy or pneumonia in March or April last (when I was at Bellevue Hospital Medical College, N.Y.)—the physician who attended him said it was pneumonia—and that he was left weak and reduced very much in flesh, and came to me for treatment. I examined him and found a large vomica in the apex of the left lung, and dullness over a large area. The night before he came to me he said something had burst in that lung, and over a quart of offensive matter had run out of his mouth and nearly choked him, and since then something has continued to break and discharge about once every one or two weeks, and always at night, near morning. Since I saw him in September he has lost in flesh rapidly, and there are now two large cavities in the lung and considerable effusion into the pericardium, while that lung is very tender on percussion. The liver is considerably enlarged (very much), and the bowels seem bloated all the time, and have not decreased in size with the rest of the body, and when stripped he looks like an emaciated child with bloated belly; he is sallow, his appetite is poor.

About a month ago he commenced coughing or vomiting up these parasites, and for ten days he ate nothing and was very weak; he said that they gagged him when coughing, and my presumption is that they came from the large cavity in the apex of the left lung, but I feel sure that his liver is also full of them, for it is much enlarged and very tender on percussion. Altogether he has coughed up from 75 to 100 of them, and they would crawl around the floor like maggots, and live for ten days in a bottle. They also stand freezing, for during the late cold snap, when he spat them upon the floor during the night and the mucus and matter froze on the floor, when the fire was kindled in his room in the morning and the spittle thawed, they would then crawl around the floor. The sound of the gurgling in his lung has a distinct metallic tinkle, only finer, more resembling the tinkling of china-ware. I will send you the specimen securely bottled to-morrow to Bellevue Hospital Medical College, and I think it very probable that I will soon obtain more; and if a *post-mortem* can be obtained after a time, I will try hard to get permission to examine the diseased organs.

Following the presentation of the case, Dr. Flint read several extracts from Aitken's "Science and Practice of Medicine," describing the parasite in question in connection with an account of the case of Private Isaac Newton.

In the sixth edition of Dr. Flint's "Treatise on the Principles and Practice of Medicine," published in 1886, at page 623, I find again briefly mentioned the above case, but without any further information.

If these two American cases were both of them true cases of porocephaliasis, it is certainly not to *Porocephalus armillatus* that they can be ascribed, because this species does not occur outside the Ethiopian region, unless it be found in some imported menagerie animal as in the case of the West African Python dissected in Boston by Dr. Savage. Therefore, we must look to some species inhabiting the Nearctic region, such as *Porocephalus crotali*, for instance, which is found in *Crotalus adamanteus*, *Crotalus horridus*, and in other rattlesnakes of the United States.

Finding that at least three other different species are still confounded with *Porocephalus crotali*, I will here give the synonymy, distribution, and history of each species.

III.—*POROCEPHALUS CROTALI* (Humboldt, 1808).

Synonyms.

Adult Form.

1808.—*Echinorhynchus crotali*, Humboldt.
1808.—*Distoma crotali*, Humboldt.
1809.—*Distoma crotali durissi*, Rudolphi.
1811.—*Porocephalus crotali*, Humboldt.
1814.—*Polystoma proboscideum*, Rudolphi.
1819.—*Pentastoma proboscideum*, Rudolphi.
1835.—*Pentastomum proboscideum* var. *coarctatum*, Diesing (in part only).
1849.—*Linguatula proboscidea*, Van Beneden (in part only).
1852.—*Pentastoma proboscoideum*, Mayer (misprint).
1852.—*Porocephalus humboldtii*, Mayer.
1852.—*Linguatula quadriuncinata*, Mayer.
1880.—*Pentastama moniliforme*, Mégnin (in part only).
1889.—*Pentastoma proboscidium*, Gottheil (misprint).

Nymphal Form.

1836.—*Pentastoma subcylindricum*, Diesing.
1850.—*Pentastomum subcylindricum*, Diesing.

Zoological Distribution.*

Adult Form.

Crotalus terrificus, Laur. Dog-faced Rattlesnake.
Crotalus horridus, Linn. Banded or Timber Rattlesnake.
Crotalus adamanteus (Beauvois), Diamond-back Rattlesnake.

Nymphal Form.

Marmosa murina (Linn.), Murine Opossum.
? *Philander philander* (Linn.), Philander Opossum.
? *Leontocebus chrysopygus*, Golden-rumped Marmoset.
? *Phyllostoma discolor*, Particoloured Javelin-bat.
? *Procyon cancrivorus* (Cuv.), Crab-eating Raccoon.
? *Rhipidomys pyrrhorhinus*, a Brazilian Field-mouse.
? *Akodon fuliginosus* (Natt.), a Brazilian Field-mouse.
? *Tatusia peba* (Desm.), Peba Armadillo.

Historical Account.

This species of tongue-worm was discovered by Alexander v. Humboldt, who first mentions it in his "Ansichten der Natur" (p. 162, 1st ed. 1808), as an Echinorhynchus from the lungs of "the Tropical rattlesnake," but in the notes and additions to this work (p. 227) he ascribes it to the Trematodes. Finally, in 1811, in the "Récueil d'observations de zoologie et d'anatomie comparée" (vol. i, pp. 289-304, published with Bonpland, he proposes to place it into a new genus for which he suggests the name of *Porocephalus*. The species he called *P. crotali*, and described as follows:—

Corpus cylindricum, subclavatum, pellucidum, transverse rugosum, margine subcrenulato, ex albo flavescens, parte anteriori et cauda obtusa albidioribus. Collum nullum. Proboscis retractilis, antice praemorsa, oris leporini in modum fissa, submarginata. Aculei quinque fuscoscentes, retractiles, uncinati, pone orem in parte inferiori corporis positi.

Habitat in pulmonibus et abdomine Crotali durissi, Cumanae (Amer. meridionalis).

Several specimens were found; they were of a yellowish colour, and measured 40 to 50 mm. in length by 3 to 4 mm. in breadth.

The largest specimen measured 62 mm. in length, 8 mm. across the anterior extremity, and 2 mm. across the posterior extremity. The great German naturalist very aptly compares the outline of the parasite to that of the silk worm, especially when seen from the side, but he mistook the mouth for a fifth hook-pouch and the uterus for the ovary and the ovary for a dorsal nerve. He saw neither sexual openings nor anus.

The host of *Porocephalus crotali* is mentioned first as "Tropical rattlesnake," and in the notes as *Crotalus durissus*. In the "Récueil d'observations de zoologie, &c.," Humboldt makes a new species of the Cumana rattler, and calls it *Crotalus cumanensis*. Doubting that the North American rattlesnake *Crotalus durissus* could be the Cumana host of Humboldt's tongue-worm, and not being able to find the specific designation *cumanensis* in any of the catalogues of the American Rattlesnakes, I consulted Dr. Boulenger, the learned herpetologist of the British Museum, and he told me that Humboldt's *Crotalus cumanensis* is without doubt *Crotalus terrificus*, Laur.

Rudolphi in 1809, in his "Entozoorum Historia Naturalis," listed this parasite amongst the species *dubiæ* under the name of *Distoma crotali durissi*. In 1814, he placed it in the genus Polystoma, termed it *Polystoma proboscideum*, and pointed

* ? signifies that the determination of the parasite is doubtful.

out its close relationship to *Linguatula serrata*, the various developmental forms of which were then called *Polystoma serratum*, *P. denticulatum*, and *P. tænioides*.

In 1819, in his Entozoorum synopsis, Rudolphi changed the generic name *Polystoma* into *Pentastoma*, and gave the following diagnosis:—

Pentastoma proboscideum R.—P. teres subclavatum, utrinque obtusum, transverse rugosum, ore fisso protractili.

In the appendix to this work at p. 434, after giving a description compiled from that of Humboldt, Rudolphi makes the following observation:—

Species tam magnitudine, qua primae hujus generis speciei (P. tænioides) soli cedit, et corpore tereti, in reliquis plano vel depresso, insignis; quinque praeterea uncinis instructa dicitur, quorum reliquae quatuor tantum exhibent, ut illius ostium medium pariter inerme haberem. Num proboscis vera sit, maxime dubium videtur, cum iconibus saltem non exprimatur, neque reliquis concessa sit speciebus. Icon apicem anticum emarginatum refert, et proboscis ill. viro.

In a second appendix, p. 687, after erroneously stating that Natterer had found the same parasite in the lungs of *Crocodilus sclerops* (= *Caiman sclerops*) the Common Caiman, Rudolphi redescribes the species from one of Natterer's three specimens which he had obtained from the Vienna Museum. His description is followed by a footnote in which he says:—

Crocodilum et Crotalum idem Pentastoma pulmonibus fovere non mirum, cum Equus, Asinus, Canis et Lupus idem Pentastoma tænioides sinubus frontalibus contineant; forsanque Capræ, Leporis et Cobayae Pentastomata a me dubie seorsim enumerata pariter unam constituant speciem.

Bremser (1824) in "Icones Helminthum systema Rudolphii Entozoologicum illustrantes" on plate X, figs. 19-24 delineates under the name of *Pentastoma proboscideum* two very different animals, *viz.*, a Linguatula (*L. subtriquetra*) of the Caiman (*C. sclerops*) and a Porocephalus (*P. stilesi*) of the Rat-tailed Viper or Fer-de-lance (*Lachesis lanceolatus*), which he erroneously ascribes to the Caiman.

Diesing (1835) under the name of *Pentastoma proboscideum* gives the following diagnosis:—

P. clavatum, transverse plicatum, utrinque obtusum; ore orbiculari intermedio protractili, foveis subarcuatim positis: spiculo maris simplici papilliformi, cute externa in forme præputii cincto.

As hosts of this species Diesing mentions: *Podinema* (= *Tupinambis*) *teguixin*, Boa constrictor, *Bothrops jararaca* (= *Lachesis lanceolatus*), *Crotalus horridus*, *Eunectes scytale* (= *E. murinus*), *Ophis* (= Xenodon) *merremi* and *Spilotes pullatus*. He does not state to which of these hosts belonged the specimens which served for his diagnosis, but he figures in his plates (plate III, figs. 37-41, and plate IV, figs. 1-10) specimens from *Lachesis lanceolatus* and *Tupinambis teguixin* which differ considerably in size and appearance. In the text following the diagnosis he states that in small female specimens from the body cavity and lungs of a rattlesnake (*Crotalus horridus*) the body presented numerous and closely set rings.

Diesing correctly points out that the Porocephalus figured by Bremser under the name of *Pentastoma proboscideum* was not found in the Caiman as stated in the Atlas, but that it was collected by Natterer from the lung of a *Lachesis lanceolatus*.

Finally, Diesing describes under the name of *Pentastoma subcylindricum* a nymphal tongue-worm found by Natterer in the liver, lungs, diaphragm, mesentery, and body cavity of the following Brazilian mammals: *Midas* (= *Leontocebus*) *chrysopygus*, *Didelphys* (= *Marmosa*) *murina*, *Didelphys* (= *Philander*) *philander*, *Procyon cancrivorus*, *Dasypus niger* (= *Tatusia peba*), *Mus* (= *Rhipidomys*) *pyrrhorhinus*, *Mus* (= *Akodon*) *fuliginosus* and *Phyllostoma discolor*. The figures representing this linguatulid (Plate III, figs. 24-36) are taken from specimens found in the Philander Opossum (*Philander philander*) and in the Murine Opossum (*Marmosa murina*).

The diagnosis of the parasite is as follows:—

P. subcylindricum, plicato-annulatum, postice subattenuatum, utrinque obtusatum; ore orbiculari intermedio cum foveis in unam lineam dispositis.

Diesing mentions over eighty rings or folds for this species, and his fig. 25 shows seventy-nine. It is carefully drawn by Zehner after a specimen from the Murine Opossum.

In his Systema Helminthum, Diesing (1850) retains the two species *Pentastomum subcylindricum* and *P. proboscideum* as distinct. Of the first he gives the following modified diagnosis:—

Corpus subcylindricum, retrorsum gracillescens, obtusum, annulatoplicatum, Caput rotundatum. Os orbiculare inter bothria in lineam rectam disposita situm. Longit. femin., 5—7″; crass., 1″.

The diagnosis of *P. proboscideum* is as follows:—

Corpus subclavatum retrorsum sensim attenuatum, obtusum, annulatoplicatum, plicis interdum evanescentibus. Caput rotundatum. Os orbiculare protractile, inter bothria subarcuatim disposita situm. Penis papillæformis, cute externa in formam præputii cinctus. Longit. maris (corp. subrecto), 8″—1″ et 3″; crass. antice, 1—1½″; postice, ½—1″. Longit. fem. (corp. incurvato), 2—3″; crass. antice, 2—2½″; postice, 1½—2″.

To this species Diesing appends a variety which he names var. *coarctatum*, and describes thus:—

Caput basi coarctatum subhemisphæricum, subtus planiusculum, corpus annulato-plicatum v. læve. Habitaculum. Coluber lichtensteinii, in Brasilia (Natterer); C. korros, in India orientali (Lamare-Piquot): in pulmonibus, M.C.V.

[Diesing's *Pentastomum proboscideum* var. *coarctatum* from the lung of *Coluber lichtensteinii* (= *Drymobius bifossatus*) is a distinct species found again by Sambon (1910) in Couper's snake (*Coluber corais* var. *couperi Holbr.*) and called *Porocephalus coarctatum* (fig. 5). Diesing places in the same variety the linguatulid found by Lamare Piquot (1835) in *Coluber* (= *Zamenis*) *Korros*. This is another distinct species found again by Captain Patton in the Indian rat-snake (*Zamenis mucosus*) and named by Stephens (1908) *Porocephalus pattoni*.]

Mayer (1852) mentions finding in the lungs of a *Lachesis rhombeata* (= *L. mutus*) twelve linguatulids very similar to those found by Humboldt in the lungs of *Crotalus terrificus*. In the same short notice Mayer proposes changing Rudolphi's

name of *Pentastoma proboscoideum* (*sic*) into that of *Linguatula quadriuncinata*. He says the term Linguatula was first used by the theologian Schrank, and should be retained in honour of the latter's great merits in natural science. The designation *quadriuncinata* is probably suggested as an offset against the term *Pentastoma* founded on the error of ascribing five instead of four hooks to the tongue-worms.

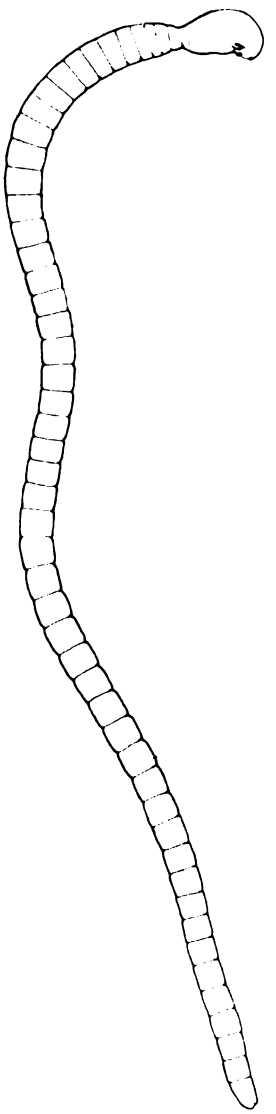


FIG. 5.—*Porocephalus coarctatum*. Mag. × 2.

Leuckart (1860) considers Diesing's *Pentastomum subcylindricum* to be the nymphal form of *Pentastomum proboscideum*, and therefore describes the two under the latter name. His diagnosis is as follows:—

Corpus subclavatum, retrorsum sensim attenuatum, obtusum, annulatoplicatum, plicis interdum evanescentibus. Cephalothorax bene distinctus, clavatus, frons rotundata. Annuli, quorum numerus est c. 40, stigmatum ordinibus plerumque 5—6 alternatim dispositis perforati. Hamulus validus, uncino bene incurvato, crasse acuminato munitus. Fulcrum latum, longiusculum, obtusum. Longitudo feminæ usque ad 80 mm., maris ad 36 mm. Latitudo anterior fem. 6, 7 mm., maris 3 mm., post. fem., 3, 5 mm., maris 2 mm. Habitat in pulmonibus boæ, crotali aliorumque serpentum Americæ, satis frequens.

Vix dubito, statum imperfectum hujus speciei esse Pentastomum, quod Diesingius, in rebus helminthologicis peritissimus, scrutator, nomine Pent. subcylindrici descripsit et depinxit. Inferior magnitudine (long., 8—16 mm., lat., 2—2, 2) forma corporis numeroque annulorum, et stigmatum plene congruit cum Pent. proboscideo, neque multum discedit fulcro atque hamulo, cui lamina chitinosa brevis, incurvata, loco hamuli accessorii juncta est. Habitat in cavo et pectorali et abdominali didelphidum aliorumque multorum mammalium Americæ, vel libere, vel capsula inclusum.

This diagnosis is mistaken, because it is based on specimens from Boa constrictor and *Didelphis* (= *Philander*) *philander* which do not belong to the species first described by Humboldt as *Porocephalus crotali*. The linguatulid of the Boa presents about forty rings, as stated in Leuckart's diagnosis, whilst the tongue-worm of the rattlesnakes has about eighty. The specimens examined by Leuckart were immature, they had been forwarded to him by Dr. Hering, who had found them in the lung of a Boa constrictor. Of the specimens received, Leuckart says:—

The largest one measured 8 mm., and was equal in shape, number, and form of rings, hooks, stigmata, indeed in every particular with the type specimen of *Pentastomum subcylindricum* Dies., so much so that, notwithstanding the diversity of the hosts in which they were found, I consider them to be identical.

The other two specimens sent by Hering were strongly curved ventrally, and might have measured 4 to 5 mm. when outstretched. The exact number of rings could not be counted, but probably were as in *P. subcylindricum* about forty.

The linguatulids from the Philander Opossum (*Philander philander*) were received from Diesing himself with the following notes from Natterer's note-book:—

Ypanema, October 9, 1821.—*Didelphis philander* with Pentastomes, of which sixty on and in the liver, twenty-five within the thoracic and abdominal cavities fixed on the viscera (two of them on the lungs, one on the heart, one between the muscles of the foreleg, the others in groups of several encysted on the alimentary tube). There was scarcely anything to be seen of the liver, it was completely covered and filled with encapsuled worms. Each worm was curled up in such a way that, as a rule, the posterior extremity overlapped the head. Each one was separately enclosed in a thin transparent membrane. The worms, which were somewhat transparent, presented a black intestinal tube, and as soon as plunged in water evacuated some black matter from an opening at the posterior extremity. They hooked themselves readily on a piece of skin. They could not be enucleated from their membranous capsules without the greatest care.

Leuckart suggests that the number of eighty rings mentioned by Diesing is no doubt a mistake. He states that Wyman (1847) had already pointed out the possible identity between the linguatulid (*Pentastomum clavatum*) found by him in Boa constrictor and Diesing's *P. subcylindricum*.

Mégnin (1880) mentions *Pentastoma proboscideum*, *Echinorhynchus crotali*, *Distoma crotali*, and *Porocephalus crotali* as synonyms of *Pentastoma moniliforme*, erroneously uniting the two species.

Bell (1880) points out that the two species confounded by Mégnin are quite distinct. He says:—

The most common entozoon of this genus (*Pentastomum*) would appear to be the *P. proboscideum* of Rudolphi, to which I should be inclined to give rather the name of *P. crotali*; for

the synonymy of Diesing, and of Rudolphi himself, seem to me to be conclusive as to the point that the credit of first describing and naming this species belongs to Alexander von Humboldt. At any rate, I am quite certain that there is no justification at all to be found for the name adopted by Mégnin in his just published and valuable handbook on parasites; for the name of moniliforme was not given by Diesing till the year 1836, and was then given to what is either a very well-marked variety of *P. proboscideum*, Rud., or, as is more probable, and as Leuckart imagines, a species distinct from that more common form.

Leidy (1884) briefly describes specimens of *Pentastomum proboscideum* presented to him by Mr. Norman Spang, of Etna, Pa., who obtained them in Florida, from the lung of a large rattlesnake *Crotalus adamanteus*. He says:—

They are cylindrical, incurved, annulated, largest and rounded at the head, tapering behind, and becoming again larger and rounded at the end, and terminating ventrally in a short conical point. There are six of them, with the following measurements: 9 lines long by 1½ lines at the head; 13 lines by 1½ lines; 24 by 2½; 28 by 2½; 30 by 3, and 31 by 3. The species was first found by Humboldt in *C. horridus*.

Professor Leidy erroneously considers the linguatulids found in the Diamond-back rattlesnake as identical with those of Boa constrictor which he had found himself several times. He obviously overlooked the difference in the number of body rings.

Mazza (1891) suggests that Harley's *P. polyzonum* should be included in this species, but there can be no doubt whatever that Harley's *P. polyzonum* found in Dr. Sharpey's collection without any label was a specimen of *Porocephalus armillatus*.

Diesing (1864) gives the following revised diagnosis of *Pentastomum proboscideum*:—

Annuli corporis 40 *et ultra stigmatibus series plerumque* 5—6 *alternatim dispositas formantibus; uncinuli bothrium simplices, fulcro lato, longiusculo, obtuso. Longit. maris (corpore subrecto)*, 8″—1′ 3″; *crassit. antice*, 1—1½″; *postice*, ½—1″. *Longit. feminæ (corpore incurvato)*, 2—3″; *crassit antice*, 2—2½″; *postice*, 1½—2″.

He states that Leuckart considers his *P. subcylindricum* as a young stage of *P. proboscideum* but retains the two species, modifying as follows his previous statement with regard to the number of rings in *P. subcylindricum*:—

Annuli corporis fere 46, *stigmatibus series circa quatuor alternantes in annulo singulo formantibus.*

Leidy (1852), under the name of *Pentastomum didelphidis virginianæ*, describes a linguatulid which he found encysted in the liver of a Virginian Opossum (*Didelphys virginiana*). He suggests that it might probably be the *Pentastomum subcylindricum* of Diesing, but describes it as a new species, owing to its smaller size and fewer rings (forty instead of eighty). For description see *Porocephalus clavatus*.

In a later paper, Leidy (1857) ascribes the linguatulid found in the Virginian Opossum to Diesing's species *Pentastomum subcylindricum*.

Cobbold (1859) in a paper on Entozoa read before the Linnean Society of London, December 3, 1857, mentions finding several examples of *Pentastoma proboscideum* occupying the mesenteric folds of a species of *Bothrops* (= *Lachesis*). (See *Porocephalus stilesi*.)

Stiles (1891), in a very valuable paper on "Bau und Entwicklungsgeschichte von *Pentastomum subcylindricum* Dies," shows how by means of feeding experiments, suggested by Professor Leuckart, he was able to obtain the development of the larvæ of *Pentastomum proboscideum* from a Boa constrictor in white mice, and thus proves that as previously surmised by Wyman and Leuckart, Diesing's *Pentastomum subcylindricum* is the nymphal form of *Pentastomum proboscideum*. (See *Porocephalus clavatus*.)

Shipley (1898), in enumerating the hosts harbouring the adult form of *Porocephalus crotali*, erroneously mentions the Lion (*Felis leo*) and the Leopard (*Felis pardus*).

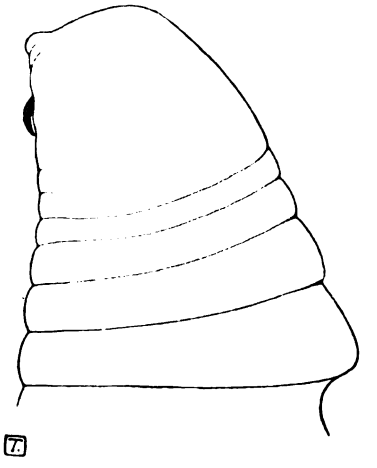


Fig. 6.

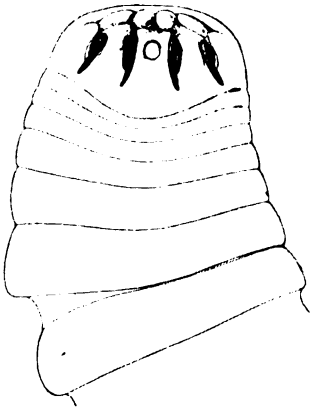


Fig. 7.—*P. armillatus*. Ventral aspect of Cephalothorax.

Geographical Distribution.—The geographical range of *Porocephalus crotali* is probably coextensive with that of the host genus *Crotalus* which spreads over Brazil, Texas, North and South Carolina, Florida, California, and even as far north as New York.

The localities in which, to my knowledge, *Poro-*

cephalus crotali has been found are: Cumana, Venezuela (in *Crotalus terrificus*, by A. von Humboldt), Ypanema, Brazil (in *Marmosa murina*, by Natterer), Florida (in *Crotalus adamanteus*, by Norman Spang), Tortuga Island, Gulf of California (in *Crotalus sp.*, by Diguet).

Description of Parasite.—Porocephalus crotali, like other species of the same genus, presents a bright yellowish colour in fresh specimens. The body is elongate, incurved, cylindrical, somewhat flattened ventrally, largest and club-shaped at the anterior extremity, tapering posteriorly and becoming again slightly larger and rounded at the posterior end which terminates ventrally in a short conical point. It is transversely encircled, not by strongly prominent rings as in *P. armillatus*, but by flat bands numbering over eighty. Humboldt's largest specimens found in the Dog-faced Rattlesnake (*Crotalus terrificus*) measured 62 mm. in length by 8 mm. across the anterior extremity, and 2 mm. across the posterior end. Leidy's largest specimen found in the Diamond-back rattlesnake (*Crotalus adamanteus*) measured 65 mm. in length by 6 mm. in breadth. Both these specimens no doubt female specimens.

I have seen only one poorly preserved female specimen of this species in the collection of the Paris "Museum d'Histoire Naturelle." It was found in 1896 by L. Diguet in a rattlesnake of undetermined species killed in Tortuga Island, Gulf of California. All I remember is that it presented over eighty annulations, an ovoid-shaped mouth on a line with the hooks, and two prominent papillæ above the oral opening. I did not examine the specimen carefully under magnification, and am therefore unable to state whether the outer hooklets were provided with accessory spines as is the case in closely allied species (*P. clavatus*, *P. stilesi*).

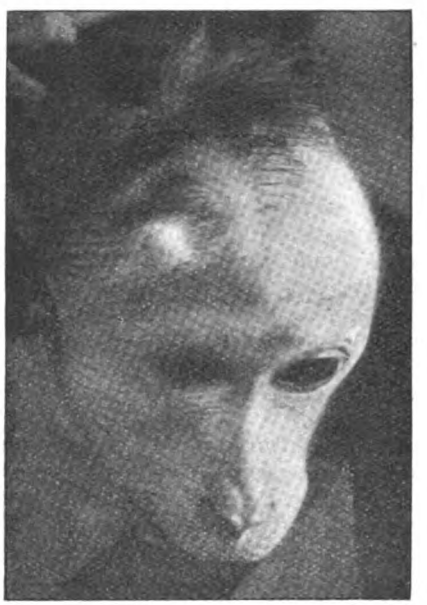
The linguatulid from the Murine Opossum (*Marmosa murina*) described by Diesing in 1835 under the name of *Pentastoma subcylindricum*, and presenting over eighty annulations, is very probably the nymphal form of *Porocephalus crotali*.

(*To be continued.*)

SOME EXPERIMENTAL FACTS *RE* KALA-AZAR (INDIAN).*

By R. Row, M.D.Lond., D.Sc.Lond.

In a former communication I pointed out that *Leishmania Donovani* of Indian kala-azar could be grown in successive cultures both in N.N.N. medium and in a hæmoglobinized saline medium described by myself; and that at a certain stage of the culture typical bodies resembling the original parasites could be demonstrated. The experimental results, both with the original virus and the culture, have now been completed, and as some of the observations are of special interest, I consider they are worthy of publication. I restrict myself here to the results obtained by infecting the monkey (*Macacus sinicus*), cutaneously and subcutaneously, with (1) original virus, (2) an old culture derived from the original virus.



Macacus sinicus, infected subcutaneously with K.-A. culture, 3 weeks old, in N.N.N. medium, on February 2, 1912. Incubation 5 months; subcutaneous nodule detected on July 2, 1912, containing *L. Donovani* which yield flagellates in culture. Lesion local only so far.

Another photograph of the same monkey.

(1) The virus was derived from a human source, and was obtained by splenic puncture. It was fairly

* From the F. D. Petit Laboratory, Byculla, Bombay.

rich in parasites. It was rubbed into the skin (after scarifying) of the forehead of a monkey in two spots, one on either side, on March 16, 1912. The scarified surface healed completely in four or five days, and nothing was marked until May 22, 1912 (about nine weeks), when a small pinhead nodule was observed on the left side. This felt hard. A small quantity of the fluid squeezed out of this after puncture when smeared and stained showed a few parasites typical of the original virus. The culture made from the same unfortunately got contaminated. This nodule has grown during these six weeks, and is now of the size of half a pea. It contains bodies recognizable as the parasites, but not so typical as those observed on May 22. The scarified spot on the right side developed two pinhead papules about June 6, 1912. These have also grown slightly, but not markedly, and they also contain bodies like those on the left side lesion, though in scanty numbers. This animal [3] is quite well and thriving. His further progress is being watched with interest to see if he will ever develop a general infection.

(2) A fifth subculture in N.N.N. medium (from the original parasite derived from the spleen of the same case as [1] on December 20, 1911), which was found to be rich in flagellates on January 20, 1912, but full of rounded forms on February 2, was injected subcutaneously into the right and left side of the forehead of *M. sinicus* [3], the portion injected on the right side being 0.3 c.c., and that on the left side 0.15 c.c. There was no local reaction at the seat of injection, which was unrecognizable even three days after the injection. The animal has been quite well and thriving. There was nothing noticed at the seats of inoculation week after week when observations were taken until July 2, 1912, *i.e.*, five months after the infection, when two nodules were found to have developed, one on each side of the forehead, at the seat of inoculation, the right nodule being distinctly larger than the left one. The nodules are freely movable under the skin; they feel like half beans under the skin, which is perfectly healthy. They are firm and almost hard. One of these nodules was punctured on July 4, and the scanty serous juice which was squeezed out when smeared, fixed, and stained showed a fair number of parasites like those found in the spleen, &c., of a kala-azar case. These parasites have reached up till now in culture (twenty-four hours) only the preflagellate stage of development, and I have little doubt by another twenty-four or forty-eight hours they will show flagellates [4].

The results of the intraperitoneal infection with the virus, as well as with the cultures, both in the monkey and in the other animals, are not yet ready, as the observations are yet incomplete.

From the foregoing experimental results the following points and facts come to light:—

(1) By the cutaneous infection of the virus of kala-azar from a human source, it is possible to induce a cutaneous lesion in a susceptible animal, *e.g.*, *M. sinicus*, the incubation period in this case being about nine weeks.

(2) By the subcutaneous injection of a three weeks old culture of *Leishmania Donovani* in N.N.N. medium, it is possible to induce a subcutaneous lesion in a susceptible animal, *e.g.*, *M. sinicus*, the incubation period in this case being about five months.

(3) Parasites resembling those found in the human tissues are found in fair abundance in these lesions artificially induced cutaneously and subcutaneously, these parasites being also culturable into flagellates in suitable media.

(4) It is not possible at present to say how far these lesions will affect the animal, *i.e.*, whether these will ultimately get absorbed without causing a general infection, or whether they will ultimately lead to a general invasion by the parasite, although from the localized nature of the nodules, their free mobility, and the general good condition of the animals, it looks as though they are going to be only local.

(5) The bearing of these lesions on the possible results of a cutaneous infection by biting insects, which might act as transmitters, is interesting.

REFERENCES.

[1] R. Row, *British Medical Journal*, March 30, 1912.
[2] R. Row, *British Medical Journal*, May 18, 1912.
[3] This animal was exhibited at the meeting of the Bombay Branch of the British Medical Association, on June 27, 1912, when the lesions were demonstrated.
[4] The culture did flagellate, as anticipated, on the fourth day.

Antityphoid Inoculation.—Spooner, in the *Journal of the American Medical Association*, October 12, 1912, gives his experiences of the use of antityphoid inoculation in training schools for nurses in Massachusetts. He concludes that frequent injections of small amounts of a low-virulence vaccine cause slight inconvenience; that they seem to produce a protection among nurses, who are eight times more liable to the disease than the average individual; that their morbidity, under ordinary conditions, is 1.4 per cent., or nineteen cases among 1,361; and that only two cases developed under these conditions.

Case morbidity among the uninoculated in these hospitals is nearly nine times greater than among the inoculated, subjected to similar conditions.

No permanent untoward effects have arisen from over 5,000 injections.

The blood-picture indicates a certain protection lasting at least two and a half years.

The use of this means of protection has been shown to be safe in two epidemics and very efficient in at least one of them.

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THE JOURNAL OF

Tropical Medicine and Hygiene

NOVEMBER 1, 1912.

LONDON SCHOOL OF TROPICAL MEDICINE.

THE annual dinner of the School was held at the Prince's Restaurant, Piccadilly, London, on October 23, 1912. General Sir Reginald Talbot, K.C.B., occupied the chair, and amongst those present were: Colonel A. Alcock, C.I.E., I.M.S., F.R.S.; Dr. K. B. Allan; Dr. F. H. Anderson; Sir John Anderson, G.C.M.G.; Algernon E. Aspinall, Esq.; Dr. J. M. Atkinson; E. E. Austen, Esq.; Dr. A. Baldie; Dr. J. W. Barrett, C.M.G.; J. H. Batty, Esq.; Dr. J. A. Beattie; Dr. T. P. Beddoes; Dr. J. M. Benson; Dr. Roland Brinton; John Buchan, Esq.; J. Cantlie, Esq., F.R.C.S.; Dr. L. Carbone; L. Vernon Cargill, Esq., Dr. R. Brudenell Carter; Dr. H. Catto; Dr. A. J. Chalmers; Dr. C. L. Chevallier; Captain A. W. Clarke; James Jackson Clarke, Esq.; Major De V. Condon, I.M.S.; Dr. E. M. Condy; Dr. J. J. Costello; Dr. J. Dalrymple; Dr. C. W. Daniels; David Davies, Esq., M.P.; Lionel Earle, Esq., C.B., C.M.G.; Dr. Fagan; Dr. J. M. Falkiner; Dr. N. M. Falkiner; A. Fiddian, Esq.; Dr. G. M. Gray; Dr. Frederick Green; Colonel M. G. E. Hale, D.S.O., R.A.M.C.; Dr. H. M. Hanschell; Dr. H. Frank Heath, C.B.; Professor R. Tanner Hewlett; Commander G. Hodgkinson, R.N.; Captain H. B. Hooper, R.I.M.; Dr. P. Gutierrez Igaravidez; Dr. J. T. C. Johnson; Dr. G. L. Johnston; Arthur Jones, Esq.; Dr. G. J. W. Keigwin; Dr. W. A. Lamborn; A. Lampard, Esq.; C. F. Leach, Esq.; Sir George Le Hunte, K.C.M.G.; Dr. R. T. Leiper; Dr. S. M. Livesey; Sir Francis Lovell, C.M.G.; Dr. G. C. Low; A. G. R. Mackenzie, Esq.; Sir Patrick Manson, G.C.M.G.; Dr. E. Marshall; G. A. K. Marshall, Esq.; T. E. Marshall, Esq.; Dr. F. C. Martley; Dr. C. W. Mason; Dr. E. H. Mayhew; A. Messer, Esq.; P. Michelli, Esq., C.M.G.; Colonel C. Monk, I.M.S.; Dr. C. A. Moseley; Colonel T. R. Mulroney, I.M.S.; Dr. R. A. Murphy; C. E. Musgrave, Esq.; Dr. H. B. Newham; C. T. Orford, Esq.; Dr. J. L. Pawan; Rev. C. Pepys; Dr. W. O. Prichard; Dr. J. Pugh; Herbert Read, Esq., C.M.G.; Dr. F. Rice; Sir Ronald Ross, K.C.B., F.R.S.; Dr. L. W. Sambon; Dr. F. M. Sandwith; Sir Ernest Shackleton, C.V.O.; Lord Sheffield; Dr. R. O. Sibley; Professor W. J. Simpson, C.M.G.; Dr. E. Slack; Fleet-Surgeon P. W. Bassett Smith, C.B., R.N.; A. Lionel Smith, Esq.; Dr. M. C. Solomon; Dr. H. G. F. Spurrell; Dr. A. T. Stanton; Dr. L. D. Stewart; Dr. Purves Stewart; R. E. Stubbs, Esq.; F. Swanzy, Esq., J.P.; Dr. H. C. Swertz; E. Thorne, Esq.; Dr. R. S. Turton; Dr. C. F. Wallace; Dr. C. M. Wenyon; Dr. F. E. Whitehead; Dr. R. F. Williams; Dr. W. C. P. Winter; Dr. J. Y. Wood; Dr. A. Wyllie; Dr. T. M. Young.

The CHAIRMAN, in proposing the loyal toasts, referred to the interest taken by His Majesty King George in the School. The visit arranged for His Majesty to the School in the summer was deferred for reasons which were well understood at the time, but His Majesty had still further manifested his high appreciation of the work being done in the School by contributing £100 to the fund now being raised to put the finances on a sound basis.

Sir RONALD ROSS, K.C.B., F.R.S., proposed the toast of "The London School of Tropical Medicine," and in a felicitous manner referred to the great work the School had accomplished. He said that although the School was opened in 1899, Sir Patrick Manson had begun to teach tropical medicine previous to that date, for he had several pupils, himself amongst the number, to whom he imparted instruction in the recognition of the malaria parasite, that great gateway to subsequently acquired knowledge in all departments of tropical medicine. When the School was opened Sir Patrick gathered together a number of capable followers and coadjutors, such men as Daniels, Cantlie, Simpson, Sandwith, Sambon, Alcock, Leiper, Wenyon, Newham, and others. A most important and far-reaching agent in rendering the School possible was found in the Committee of the Seamen's Hospital Society, and especially by securing the enthusiastic support of P. Michelli, Esq., C.M.G., the indefatigable Secretary of the Society.

The part played by Mr. Joseph Chamberlain in the formation of the School was now a matter of history, and the great talents of this eminent

statesman were never better directed than in the alleviation of human suffering by the promotion of the Schools of Tropical Medicine in London and Liverpool. Recently, Sir Ronald said, he had visited the London School to gather information, and whilst he found every branch fully equipped and doing good work, he thought that in tropical schools more should be done for the teaching of tropical sanitation. This necessitated extensive laboratories, a staff of skilled teachers, and the matter was, as usual, merely a question of money. He would advocate a separate course, of say some months, taken up after the initial course on tropical diseases had been gone through. The hopes of doing permanent good in fighting disease in the Tropics lay in the direction of sanitation and hygiene, and he hoped to see this branch of work taken up and taught in a manner worthy of its importance.

In response to the toast, the Chairman, Sir REGINALD TALBOT, referred to the great assistance rendered the School by Mr. Austen Chamberlain, who had so enthusiastically taken up the work begun by his distinguished father, and to the Colonial Secretary, Mr. Harcourt, who on several public occasions and in the House of Commons had advocated the claims of the Schools of Medicine for public and Government support. The Home Government had done a great deal and the Governments of the Crown Colonies had each contributed liberally according to their possibilities.

At the Mansion House meeting, on February 28, 1912, the following sums were subscribed towards the enlargement of the School, chiefly at the instigation of Messrs. Harrisons and Crosfield, of which Mr. Arthur Lampard is a prominent member: H.M. Treasury, £500; *George Croll, Esq., £50; Messrs. Edward Till and Co., £52 10s.; *Messrs. Harrisons and Crosfield, Ltd., £100; *C. Heath Clark, Esq., £100; *Arthur Lampard, Esq., £100; *The Rubber Plantations Investment Trust, £100; The British North Borneo Co., £25; Messrs. Coulon, Berthoud and Co., £10 10s.; Messrs. Laurence, Sons, and Gardner, £21; Messrs. Frank T. Wilson and Co., £10 10s.; Mortimer Singer, Esq., £200; Sir Wm. Treacher, K.C.M.G., £5 5s.; The Kapar Pará Rubber Estates Co., £10 10s.; The Ulu Rantau Rubber Estates Co., £5 5s.; Messrs. S. Figgis and Co., £10; The Pataling Rubber Estates Syndicate, Ltd., £25; The Selaba Rubber Estates, Ltd., £25; The London Asiatic Rubber Co., Ltd., £25; *H. Eric Müller, Esq., £25; The Golden Hope Rubber Estate, Ltd., £20; The Sepulmalkande Rubber Co., Ltd., £20; The Sungkai-Chumor Estates, Ltd., £10 10s.; The Bajoe Kidoel Rubber and Produce Co., £25; The Highlands and Lowlands Pará Rubber Co., £25; Straits Plantation Co., £10 10s.; Messrs. Whiteway, Laidlaw and Co., £10 10s.; The Lord Sheffield, £50; Baron Erlanger, £250; Messrs. Pauling and Co., £250; F. Swanzy, Esq., £50; J. P. Hornung, Esq., £250. [Where an item is preceded by an asterisk (*) the contributions will be doubled on the Fund reaching £20,000.]

Sir PATRICK MANSON also responded to the toast and expressed regret that he had been obliged to harbour his strength and curtail to a considerable extent active participation in teaching, but so long as he was able he would accede to the kind request of the clinical teachers in the Hospital to give instruction there. Sir Patrick drew attention to the number of teachers in the School who had given up their whole time to investigation and to teaching, and he considered that these men should be specially dealt with in regard to remuneration. He would suggest that a pension ought to be granted to men to whom practice and the fees derived therefrom are denied, so that he hoped to see the chairs held by these accomplished men endowed with a pension fund in return for their devotion to science. He agreed with Sir Ronald Ross as regards the importance of teaching tropical hygiene in a more extended form than is at present possible. Sir Patrick reviewed the work done by the School in late years as regards research and drew attention to the excellent work done by Alcock, Leiper, Wenyon and Bahr in this direction.

The toast of "The Guests" was given by Lord SHEFFIELD, whose interest in the School has been manifested in many ways, financial and deliberative.

Sir ERNEST SHACKLETON, C.V.O., responded in a breezy speech, and gave some of his experiences in the Arctic regions, "where tropical germs do not exist."

The toast of "The Chairman" was given by Professor F. M. SANDWITH, F.R.C.P.

I.M.S. OFFICERS AND STUDY LEAVE.

THE following revised regulations regarding the grant of study leave to officers of the Indian Medical Service we think may be of interest to our readers:—

Extra furlough for the purpose of study may be granted to officers of the Indian Medical Service on the recommendation of the Director-General, Indian Medical Service. The period of such study leave will be calculated in the case of an officer taking study leave while under military leave rules at the rate of one-twelfth of pension service, and in the case of an officer taking study leave while under civil rules at the rate of one-twelfth of the same as requalifies for his furlough under Articles 302 and 303 of the Civil Service Regulations up to a total in any case of twelve months in all during an officer's service. Study leave may be taken at any time, but will not be granted more than twice in the course of an officer's service. The conversion under Rule 8 of part of an officer's furlough into study leave does not count as a grant of study leave within the meaning of this rule. The minimum period of study leave which will render an officer eligible for study leave shall be two months. The minimum period granted solely as study leave shall be six months. The time spent on the journey to and from India by an officer whose study leave is not combined with other kind of leave will reckon as study leave, but the allowances specified in Rule 10

will be granted during the period of study. Only an officer whose study leave is combined with any other kind of leave will, however, be required to take his period of study leave at such a time as to retain at its conclusion a balance of other previously sanctioned leave sufficient to cover his return journey to India.

When an officer has been granted a definite period of study leave and finds, after arrival in England, that his course of study will fall short of the sanctioned period to any considerable extent, his balance from India will be reduced by the excess period of study leave unless he produces the assent of the authorities in India to his taking it as ordinary furlough. Study leave can be combined with any other kind of leave provided the period occupied in study is not less than two months, and in the case of leave on medical certificate provided that the Medical Board at the Indian Office certifies that the officer is fit for study. In the case, however, of officers in military employment study leave cannot be taken in continuation of the combined privilege leave and furlough admissible under the terms of India Army Order No. 64 of 1901, if the total period would thereby exceed eight months: but study leave may be so taken provided such leave is not less than two months and the total period of combined privilege leave, furlough, and study leave does not exceed eight months. This limitation to eight months does not, however, apply in the case of study leave combined with privilege leave alone.

The total period of absence from duty in India in the case of officers under the leave rules of 1886 for the Indian Army will be strictly limited to two years, except as provided in Rule 8. All applications for study leave shall be submitted with the audit officer's certificate to the Director-General, Indian Medical Service, through the prescribed channel, and the course or courses of study contemplated, and any examination the candidate proposes to undergo shall be clearly specified therein. Officers on furlough who wish to have part of their furlough converted into study leave should address the Under Secretary of State, India Office, and should furnish a statement showing how it is proposed to spend the study leave. Similarly, officers on furlough or other leave who desire to have it extended for purposes of study should address the Under Secretary of State, but in addition to the statement of the proposed study they must support their applications with documentary evidence of their having obtained the approval of the authorities concerned in India to their applying for an extension of leave.

An officer who is at home on combined leave may be permitted to commence a course of study before the end of his privilege leave and to draw for such period the lodging allowance admissible under Rule 10 without forfeiting his privilege leave allowances during such period. For all purposes of record and subsequent calculation of leave the full amount of study leave taken shall in such cases be post-dated as if commenced at the end of the privilege leave. For the course of study lodging allowance at the rate of 8s. a day for a field officer, 6s. for a captain, and 4s. for a lieutenant will be granted on the production of the certificates required by Rule 12. It is to be understood that in order to qualify for the grant of study leave, or for the receipt of lodging allowance a definite course of study at a recognized institution, which will occupy the time of the officer on leave for six days a week, must be pursued. This allowance will not be admissible to an officer who retires from the Service without returning to duty in India after a period of study leave. Lodging allowance will be admissible up to fourteen days for any period of vacation.

The rate of pay admissible during study leave is as follows:—

(*a*) To an officer taking study leave while under military leave rules, the rate of furlough pay admissible to him under those rules.

(*b*) To an officer taking study leave while under civil leave rules, the rate prescribed in Article 314 of the Civil Service Regulations for an officer on ordinary furlough, subject to the limits laid down in Article 314 (*a*).

On completion of a course of study a certificate on the proper form (which may be obtained from the Indian Office), together with any certificates of special study, should be forwarded to the Under Secretary of State, India Office, who will arrange for the transmission of copies of the documents to the Director-General, Indian Medical Service. Officers may also be called upon to report themselves in person to the President of the Medical Board, India Office, on the conclusion of their course of study.

Study leave will count as service for promotion and pension, but, except so far as it may be taken during privilege leave (see Rule 9), it will not count for furlough or any other leave. It will not affect any leave which may already be due to an officer, and will not be taken into account in reckoning the aggregate amount of furlough taken by an officer towards the maximum period of six years admissible under Article 299 of the Civil Service Regulations.

Annotations.

Sand-flies and Sand-fly Fever.—Colonel Robinson and Major Blackham, R.A.M.C., contribute a very interesting paper on "Sand-flies and Sand-fly Fever on the North-west Frontier of India" to the *Journal of the Royal Army Medical Corps*, October, 1912. Four varieties of *Phlebotomus* or sand-flies are found in the Peshawar Valley and the frontier posts of the division—these are (1) *Phlebotomus papatasii*, (2) *P. minutus*, (3) *P. molestus*, and (4) *P. babu*. The habits of these flies are as follows:—

The insects have been found in (1) barracks, (2) occupied bungalows, (3) disused houses in inhabited areas.

They are generally found on whitewashed walls, and appear to avoid painted or distempered surfaces. They affect shady places on the wall at least four and a half feet about the ground level. They are not

found at an elevation above 7,000 feet and are singularly absent from Cherat and Malakand. The authors attribute this to the following facts: (1) That these stations are exposed, and there are strong constant winds in the cooler months and dust-storms in the hotter ones which are prejudicial to the fly; (2) that the bungalows are nearly all new ones with well-built, properly plastered walls, which offer little facilities for the lizard or woodlouse to breed in; and (3) that moisture which seems so conducive to the fecundity of the sand-fly is conspicuous by its absence in both these places.

Time of Biting.—Unlike the mosquito, the insect bites all through the twenty-four hours.

Length of Flight.—The authors think that the length of the sand-fly's flight is very short, and their experiments go to show that the insect is born, feeds, propagates its species, and dies within the same bungalow and even within the same room.

Hiding-places during the Day.—Behind doors, in bath rooms and shady places. After dusk the fly descends the wall in a kind of zig-zag jumps, and then flies away.

Substances which attract.—The sand-fly is attracted by three things—light, the smell of human beings, and the smell of kerosene oil.

Optimum Temperature.—Undoubtedly 70° to 90°. Below 70° the insect becomes lethargic, above 90° it again loses its activity.

Season of greatest Prevalence.—Sand-flies are most numerous during the latter part of April and the month of May. They diminish in numbers in June and July, become numerous again in August, and lessening gradually in September and October disappear entirely as the end of the latter month approaches.

Posterior Nucleated Trypanosomes.—Blacklock, writing in the *British Medical Journal*, October 19, 1912, states that while carrying out some experiments on the degenerative changes undergone by trypanosomes in the cadaver of the animal host, he observed in the blood of a rat which had been inoculated for the purposes of the experiments with the strain of *T. Brucei* (Uganda), some of the short, stumpy forms of parasite presenting a position of the nucleus posterior to the centre. The strain employed was obtained from Sir David Bruce in September, 1910. In consequence of this observation films taken from the laboratory animals employed for carrying on this strain and for experimental purposes during the period that the strain has been kept going in the laboratory were examined carefully and searched for parasites presenting this peculiarity in the position of the nucleus. As a result of this examination Blacklock found that not only in rats, but also in rabbits and guinea-pigs, such forms appeared, usually in small numbers. In no case in these preparations was the nucleus observed to lie actually posterior to the blepharoplast, but in many instances it approached very closely to that structure.

Kala-azar.—Patton continues his studies on the development of the parasite of Indian kala-azar.* His main conclusions, drawn from his most recent observations, are as follows: The parasites taken up by a bug in its last feed from an infected person are the only ones which can develop, and they can only complete their development provided the bug does not again feed before the final post-flagellates are formed. This statement may have, however, to be modified later, and many more experiments will have to be carried out in order to clear up some points which are yet obscure. It is important to know whether bugs fed on a case whose blood contains a few parasites, will show a heavy infection with flagellates, and also whether the parasite can complete its development in any stage of the bug, and during the Madras hot weather temperature. Patton hopes also to carry out some immunity experiments in order to see whether a healthy person's blood will destroy the flagellates, and as to whether this will lead to some satisfactory form of treatment. Experiments will also be carried out with animals—the dog, for instance—to again see whether it is the natural reservoir of the parasite in Madras. Transmission experiments with both *Cimex rotundatus* and *Cimex lectularius* and the parasite of tropical sore are now in progress, and from the new facts discovered as a result of the further study of this allied parasite, the author hopes to be able to transmit this parasite by the bed-bug.

Since the above memoir was written, Patton has succeeded in infecting a white rat, by inoculating it intraperitoneally with 3 c.c. of emulsion, made from a spleen removed *post mortem* from a patient who died of kala-azar. The rat died two hours after it was given a second inoculation of 1 c.c. of a similar emulsion, this being fifteen days after the first inoculation. Its liver and spleen were considerably enlarged, and contained large numbers of the typical parasites. None were found in the bone-marrow. It will be remembered that Laveran and Petit have carried out a very similar experiment with *Leishmania infantum* (Nicolle), but the white rats they inoculated never showed any parasites in their organs; this in the author's opinion suggests that the two parasites are totally distinct species. He has also inoculated monkeys, dogs, jackals, rabbits, guinea-pigs, cats, a calf, a pig, and a goat, but at present these animals show no signs of having contracted the disease. The above animals, as well as other white rats, similarly inoculated, are to be kept under observation for a long time, however, so that there will then be no doubt as to whether they are susceptible or not.

Blackwater Fever.—Captain Skelton, R.A.M.C., in the *Journal of the Royal Army Medical Corps* for October, 1912, reports a case of blackwater fever, and makes the following interesting suggestions:—

"As to the cause of 'blackwater' fever, might

* Scientific Memoirs by Officers of the Medical and Sanitary Departments of the Government of India. The Development of the Parasite of Indian Kala-azar. (New Series.) No. 53.

we not be dealing with certain 'strains' of the *Plasmodium malariæ?* Is it not possible to conceive of certain 'strains' as being especially resistant to the immune bodies that are produced in the hosts? And going still further, can we not produce a strain which becomes a 'super-parasite,' and is resistant to quinine? Owing to unfavourable surroundings and conditions, such as the presence of antibodies in the host, &c., development may be hindered for prolonged periods, until finally parthenogenesis may occur if the species is to be perpetuated. Can it not be conceived that the large parthenogenetic forms of the *P. malariæ*, containing as they do a large amount of nuclear matter and pigment, are so intensely toxic in their products as to give rise to the condition of 'blackwater'? This theory of compulsory parthenogenesis in its relation to the production of 'blackwater' fever would fit in with the sudden onset and the sporadic nature of the disease, and it would also explain why paludics who have been taking quinine suddenly get 'blackwater.' Under the influence of quinine, it can be conceived that the parasite will assume its most resistant form in its struggle for survival, an analogy to the granular stage in the life history of spirochætidæ, so that, in other words, quinine can either cure the disease or be the innocent cause of inducing the formation of the highly resistant and intensely toxic parthenogenetic form of Plasmodium."

The author believes that the moral of the case described by himself appears to be that when once a West Coast paludic has had "blackwater" one cannot promise that he will not get it again, even after an interval of years.

Malaria contracted in England.—Captain Gibbon, R.A.M.C., reports a case of malaria contracted in England,* the third reported in the *Journal of the Royal Army Medical Corps* within the last few years.

A soldier in "The Buffs" reported sick at the Military Hospital, Canterbury, on the afternoon of May 21, 1912, complaining that he had had an attack of shivering. His temperature was taken and found to be 103° F., but by 6 p.m. it had fallen to 101° F.; he was then sweating freely and complained of headache. He stated that he had had a similar attack on the afternoon of the 19th, but not so severe.

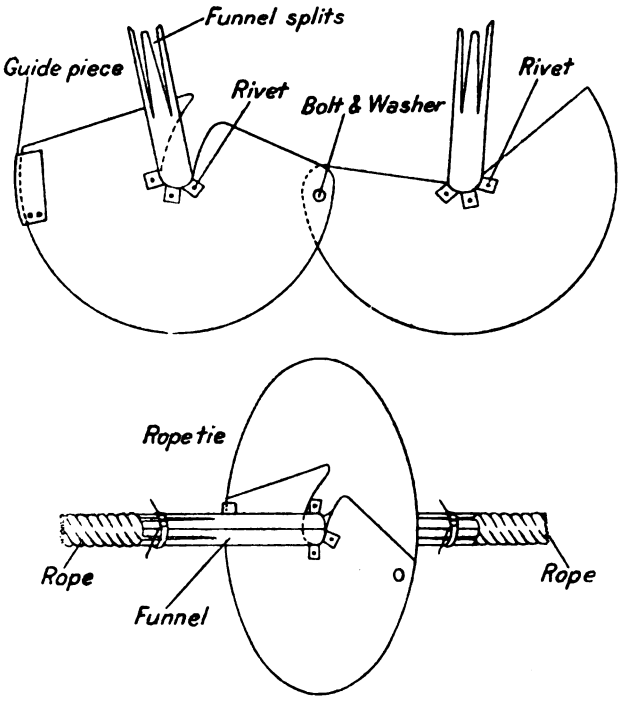
The clinical symptoms were so like malaria that several blood films were taken the following morning, and benign tertian parasites were found. Films sent to Major J. C. Kennedy, R.A.M.C., at the Royal Army Medical College, also were positive.

The patient, aged 17½, enlisted two months previously in the Special Reserve of "The Buffs," and came to the depot at Canterbury for his training. He was born in the village of Lydd, in Romney Marsh, and had never been away from home before. None of his family had ever been out of England.

Before enlistment he worked as a butcher's assistant. During last autumn he stated that he had a similar illness, the shivering or shakes coming on every third day. At the same time a good many people in the village had similar attacks, including his own father, but the patient could not remember such illnesses in previous years. An interesting feature of the case was that the man himself called the illness "marsh fever."

* *Journal of the Royal Army Medical Corps*, vol. xix, No. 4, October, 1912.

A Rat-guard used in the Philippine Islands.—The United States Public Health and Marine Hospital Session Report of June 4, 1912, contains a description of a useful and easily applied rat-guard for preventing rats entering or leaving ships in port by way of the mooring ropes. It is an effective barrier against the passage of rats, it is cheap, readily applied, and not easily made unserviceable by hard usage.



It consists of a single disc in two parts with arms (funnels) from both sides. It is hinged by bolting at the periphery. It is adjustable to many different sizes of rope and fits closely to the rope by tying on both sides. The distal portion of the arms is cut longitudinally into three strips so that they may be bent to come into immediate contact with the rope when tied.

Details of the construction may be useful: flat sheet galvanized iron is used for all parts; 20 to 24 gauge is best for strength and is not too heavy. The shield should not be less than 3 ft. in diameter, the funnel tubes should be 18 in. long on each side of the shield. A central aperture made for a 3 in. rope will serve for smaller lines as well. When used for encircling a number of lines at the same time the shield should be 4 ft. in diameter and the funnel tube enlarged and supported by five flanges and five rivets instead of three.

There is a guide permitting a perfect apposition of the two parts of the disc when closed; this piece is riveted on one side only and then bent round the circumference. The rivets which fasten the funnel tubes go through the tube flanges on each side of the shield. One bolt, two washers and five rivets are needed for each guard. When badly damaged by use or carelessness a block of wood and a hammer are all that is required to restore the guard to its former usefulness. A diagram is appended.

Notes and News.

THE FIRST EXPEDITION FROM THE TULANE UNIVERSITY SCHOOL OF TROPICAL MEDICINE TO THE TROPICS FOR THE STUDY OF MALARIA.—This expedition was made possible through the kindness of an unknown friend of the School who, through Dr. Isadore Dyer, Dean of the Medical Department of Tulane University, contributed a fund to finance the project.

The United Fruit Company, who have already contributed $25,000 towards the expenses of the School of Tropical Medicine, placed their steamships and other equipment at the service of the School for the transportation *gratis* of the expedition and apparatus. Colonel W. C. Gorgas, Chief Sanitary Officer of the Panama Canal Zone, with various members of his staff, placed all the material in his hospitals at the disposal of the expedition and extended every possible courtesy.

The personnel of the expedition consisted of two members of the School, Dr. Charles Cassedy Bass, Assistant Professor of Tropical Medicine and Hygiene, and Dr. Foster Mathew Johns, Assistant in the Laboratories of Tropical Medicine and Hygiene.

The object of the investigation was the cultivation of the malarial parasites *in vitro* which had already been accomplished by Professor Bass, but many details of which remained to be elucidated and confirmed.

In this the party obtained complete success. It was found that the malarial plasmodia can be grown in human serum, in Locke's fluid (from which calcium chloride is omitted), and in human ascitic fluid. In the majority of cases dextrose must be added to the medium to secure satisfactory growth. The most favourable temperature for the cultivation of plasmodia is about 40° C.

Positive cultures were obtained from twenty-nine cases of æstivo-autumnal malaria, six cases of tertian, and one case of quartan. Cultures were carried on for four generations from the parent culture before the expedition left Central America, and can probably be maintained indefinitely.

The full report of the expedition may be found in the October number of the *Journal of Experimental Medicine*.

In addition to these researches, the School has also carried out experimental work on pellagra, leprosy, beri-beri, blackwater fever, filariasis, and other tropical diseases, which work will be found in the forthcoming first report of the School.

The School is under the direction of Dr. Creighton Wellman, formerly of West Africa and the London School of Tropical Medicine, is an integral part of the Medical Department of Tulane University of Louisiana, and begins its second year of existence with bright prospects.

PROPOSED TROPICAL SCHOOL OF MEDICINE.—The *Pioneer* states that inquiries made of the Calcutta University authorities with reference to the intimation received from Simla that the Secretary of State has sanctioned the Government of India's scheme to establish a tropical school of medicine at Calcutta, show that no official communication has yet been received. The budget grant for the purpose is five lacs. If the money is given to the Medical College as stated for the purpose of establishing a tropical school of medicine, the University authorities are fully prepared to have a diploma instituted qualifying students, as originally suggested by the Government of India. They are particularly anxious to have the scheme carried through with the least possible delay, as the facilities at present offered to students for the study of tropical diseases are wholly inadequate. Therefore it is hoped that, assuming the scheme has been sanctioned, the Government will furnish the money forthwith, so that the scheme may be pushed on with celerity. The school, when established, will be the first tropical school of medicine in India.

It is expected that advocates of the proposed Dacca University will make an effort to have it located in Dacca. In opposition to this suggestion it is urged that the establishment of a school in the second capital is not feasible because the school must be manned by first-rate professors, which would be possible only in important centres like Calcutta. Another argument against Dacca is that if a self-contained tropical school of medicine were founded there or elsewhere in the mofussil, the cost would be prohibitive. Established in connection with the Calcutta Medical College, the college professors would give their time for the work of the school. In a mofussil station, where there is no medical college, a staff of whole-time professors would be required. This would raise the cost of maintenance. Originally it was anticipated that the school would be built and ready for work by the middle of next year, but it cannot now be said when the school will be established.

THE SOCIETY OF TROPICAL MEDICINE AND HYGIENE.

AT a meeting of the Society of Tropical Medicine and Hygiene, held at 11, Chandos Street, Cavendish Square, London, W., on Friday, October 18, 1912, at 8.30 p.m., the following gentlemen were elected Fellows: A. R. Contractor, M.D., London; J. E. L. Johnston, M.B., Ealing; E. M. Parsons-Smith, M.B., Khartoum; Captain D. S. Skelton, M.R.C.S., R.A.M.C., Zanzibar.

Notes on Books.

THE SNAKES OF SOUTH AFRICA: THEIR VENOM AND THE TREATMENT OF SNAKE-BITE. By F. W. Fitzsimons, F.Z.S., F.R.M.S., Director, Port Elizabeth Museum. T. Maskew Miller, Cape Town and Pretoria. Longmans, Green, and Co., 39, Paternoster Row, London; New York, Bombay, and Calcutta. 1912.

The above is a second edition of a book first brought out by the author some years ago. The first edition was hurriedly written up from notes at a time when the author was busy with many departments of other work and necessarily was somewhat immature. The present edition is that first edition carefully revised, extensively altered and enlarged, with the results of later experiments and experiences incorporated.

Many valuable illustrations have also been added. There are fourteen chapters, and the book runs to 547 pages including the index. The matter is of the greatest interest both for the expert and the layman, and all interested should certainly read the book. It is well and clearly written, and is beautifully illustrated with photographs and coloured plates.

It deserves to be successful, and it should have very good sales in England, South Africa, India, and other parts of the British Empire.

DISEASES OF THE THROAT, NOSE, AND EAR, FOR PRACTITIONERS AND STUDENTS. By W. G. Porter, M.B., B.Sc., F.R.C.S.Edin., Surgeon to the Eye, Ear, and Throat Infirmary, Edinburgh. With 77 illustrations, 44 of which are in colours. Bristol: John Wright and Sons, Ltd. London: Simpkin, Marshall, Hamilton, Kent and Co., Ltd. 1912. Price 7s. 6d. net.

This little book should be found useful by those for whom it is intended. The author's object in writing it has been to provide the practitioner and senior student with a single volume of moderate size, embracing sufficient information on the diseases of the throat, nose, and ear to be of value in practice. For this purpose special attention has accordingly been paid to diagnosis and to treatment in so far as the latter can be carried out by the non-specialist.

The book contains a very good account of the diseases in question.

It is short and to the point, and is well illustrated.

It can be thoroughly recommended for practitioners in the Tropics, because a book containing so much information in such a short space is just what the man abroad wants; and that especially so as he may at any time be called upon to deal with lesions of the throat, nose, and ear himself without the help of a specialist to direct him.

Personal Notes.

INDIA OFFICE.

From September 23 to October 26.

Arrivals Reported in London.—Major W. J. Niblock, I.M.S.; Captain K. W. Mackenzie, I.M.S.; Lieutenant J. E. Wilkinson, I.M.S.; Lieutenant-Colonel D. H. Graves, I.M.S.; Captain F. R. Connor, I.M.S.

EXTENSIONS OF LEAVE.

Lieutenant-Colonel C. Duer, I.M.S., 6 m.; Major G. Bidie, I.M.S., 6 m. M.C.; Lieut. J. F. H. Morgan, I.M.S., to January 1, 1913; Lieutenant-Colonel C. A. Johnstone, I.M.S., 5 days.

PERMITTED TO RETURN.

Capt. J. C. Fraser, I.M.S.

LIST OF INDIAN CIVIL OFFICERS ON LEAVE (INCLUDING MILITARY OFFICERS UNDER CIVIL RULES).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Barnardo, Captain F. A. F., I.M.S., Bl., 30 m. 3 d., May 29, 1912.
Jennings, Lientenant-Colonel W. E., I.M.S., Bo., 6 m., August 11, 1912.
MacKelvie, Major M., I.M.S., B., 12 m., November 18, 1911.
Niblock, Major W. J., I.M.S., M., 15 m., September 9, 1912.
Steen, Captain H. B., I.M.S.

LIST OF INDIAN MILITARY OFFICERS ON LEAVE.

Showing the Name, Regiment, or Department, and the Period for which the Leave was granted.

Atal, Major P. P., I.M.S., 1 y., from April 1, 1912.
MacKenzie, Captain K. W., I.M.S., 1 y., from August 22, 1912.
Morgan, Lieutenant J. F. H., I.M.S.
Nutt, Captain H. R., I.M.S.
Price, Major R. H., I.M.S., 1 y., from December 10, 1911.
Quirke, Captain M. J., I.M.S.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"Journal of the American Medical Association."

Diagnosis and Treatment of Pruritus.—In the *Journal of the American Medical Association* appears the following extract of a paper by I. Dyer, New Orleans, published in the *Journal of the Arkansas Medical Society* of August, 1912:—

"There are no specifics for itching, but there are medications in particular diseases which may apply for general use, of course individualizing the case in hand. Arsenic is the prime treatment for the nervous basis of the disease, and its administration is largely corrective of the itching. The derivatives of wheat and oats may aid in these types, and the tincture of *avena sativa* (wild oats) is of special usefulness, given in conjunction with the arsenic. Where there is no neuropathic cause or association, the arsenic not only does no good, but it may actually do harm by local over-stimulation. Strychnine serves excellently in the vasomotor disturbances with itching. Zinc phosphide acts similarly, and is of special service in chronic itching diseases. Cannabis indica, in the fluid extract, may be used every hour in five-drop doses; as soon as the acute itching is controlled, the dose may be reduced and the

period of administration lengthened to every three or four hours. Chloride of calcium is of service in senile pruritus, and in all itching where there is any suggestion or evidence of lowered coagulability. Freshly prepared chloride of calcium may be administered in 5 to 15 gr. doses, well diluted and repeated every three or four hours. Antipyrin and salicylate of soda, used in combination, serve best in gouty subjects or in uric acid cases. The use of the sodium and potassium citrates, at the same time, materially aids in the treatment. Gelsemium, codein, veratrum viride, bromides, chloral hydrate and chloroform are among the antispasmodics which have good effect in stopping the paroxysms of itching, but any and all of these may be relegated until the above-named drugs have been first essayed. The too free use of morphine for itching should be condemned. With all cases of pruritus, mild laxatives, diuretics, mineral waters of alkaline sorts, diet restrictions and limitations by injunction, habits, &c., should be carefully weighed and considered where indicated.

"The local treatment of pruritus is of considerable importance and needs to be suited to the particular case. General baths are of supreme service in the treatment of itching, and these should be taken as hot as can be comfortably borne. Such baths may be employed in all diseases or conditions in which itching is general. The baths may be plain or may carry such emollients as starch, marshmallow or bran (in bags), or alkalies may be added, such as carbonate of soda (℥ss to ℥i to 30 gallons of water), household ammonia (℥i, ℥ii to the 30 gallons), or sulphuret of potassium (℥ii, ℥i to the bath), the last-named being especially indicated in all parasitic diseases, vegetable or animal. Wet dressings may be substituted for the general bath, when the itching is so localized as to permit of such. The dressings should be kept wet with saturated boracic acid solution, 1-5000 to 1-10,000 mercuric chloride solution, 1 per cent. phenol solution, 1-1500 potassium permanganate solution, or 1 or 2 per cent. solutions of resorcin, in water always. Fixed dressings of coal tar made into a felt with superimposed cotton may be applied and left in place for days at a time. Even dry cotton may be firmly bound in place, when such a dressing can be so fixed that the patient cannot remove it easily.

"Oily substances may be employed and the old-fashioned carron oil may be used, or camphor and chloral hydrate. Cocoa butter and coco-nut oil are excellent protective applications when the skin is dry. An oily substance of excellent antipruritic value in small areas may be derived by combining phenol, menthol, camphor and chloral hydrate, and this may be diluted with any of the simple oils. Itching of the anal area is frequently relieved by ergot, used either in ointment made with the fluid extract or in suppository with the solid extract. Intestinal parasites should be excluded or removed. Genital pruritis is often helped with weak resorcin solutions. The use of the high frequency spark over the sacral plexus is an excellent adjuvant for genital pruritus and a systematic general effleuve will often aid when other remedial agents fail. All cases of pruritus should be studied as individual types, and the etiology should be determined when possible; then the way to cure will be easier."

"Indian Medical Gazette," October, 1912.

The Destruction of Bugs.—Ganguli advises turpentine for the destruction of bugs. He states that he has tried it on several occasions and can at once, without any fear of contradiction, say that the results are simply wonderful. Its cimicidal effect on bugs is direct and complete. Moreover the action is immediate. In his experience scarcely a minute is required to kill hundreds with a few drops of the drug. It can reach the insects in the crevices; it is innocuous to human beings; it does not injure the woodwork, varnish, &c.; it is inexpensive, and a very small quantity can serve the purpose. It does not require an intelligent or a trained hand for the operation.

"The Australasian Medical Gazette," September 21, 1912.

Centipedes.—Burton Cleland, in a paper on "Injuries and Diseases of Man in Australia attributable to Animals except Insects," states, as regards centipedes:—"Centipedes, often of large size and up to 10 in. in length, are common in the interior parts of Australia, but records of injuries from them are few. Those in the interior who have to camp out much, lying on the bare ground, frequently find them in or on their blankets. Dr. Mjoberg, leader of the recent Swedish Scientific Expedition to North-west Australia, was, according to a report in the daily Press, bitten on the finger and shoulder by a centipede, and had his arm in bandages afterwards for three weeks."

"Transvaal Medical Journal," vol. viii, No. 2, September, 1912.

Jiggers.—Adam, in the *Transvaal Medical Journal*, September, 1912, reports the presence of jiggers in mine dust in the Transvaal. He states that he has found this flea in enormous numbers in coal mine dust, and the possibility of the gold mine dust also becoming infected he believes to be a real one. He thinks that the best prophylactic measure for large areas is to sprinkle a solution of fresh chloride of lime freely over the infected ground. East Coast boys coming to the mines should be carefully examined for jiggers, and infected boys detained till their feet are free from fleas.

"Indian Medical Gazette," October, 1912.

Amœbiasis.—Anderson reports a case of liver abscess with amœbæ, in which no antecedent bowel disease had been discovered. Such cases, of course, are quite common clinically, but when they come to autopsy signs of old dysenteric lesions, not necessarily severe or widespread, are usually found.

"Indian Medical Gazette," October, 1912.

Pancreatic Hæmorrhage.—Matthews reports an interesting case of a fatal hæmorrhage into the pancreas in a Mahommedan female. Death took place 24 hours after the onset of the symptoms. At the autopsy the following conditions were found: Abdominal organs all healthy, with exception of pancreas. In the head of the latter a recent hæmorrhage about the size of a walnut was present, while there were several smaller superficial ones over the body. There were no signs of fat necrosis, nor of inflammation, nor general disease of the pancreas. No gall stones. Uterus nulliparous. Absolutely nothing to account for the hæmorrhage or its disastrous results could be determined.

"Annals of Tropical Medicine and Parasitology," October 18, 1912, vol. vi, No. 3. B.

Canine Piroplasmosis.—Symons and Patton report favourably on the treatment of canine piroplasmosis with salvarsan. As far as the authors are aware the disease has not been treated with this drug previously. One injection of 0.6 grm. appears to be efficient.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

CASES OF PSEUDO-SPRUE PROBABLY DUE TO A FLEXNER-LIKE BACILLUS.

By ALDO CASTELLANI, M.D.

Director Government Clinic for Tropical Diseases, Colombo (Ceylon).

IT may, perhaps, be of interest to put on record three peculiar cases I have observed in Ceylon, which clinically were typical cases of sprue, but which further investigation, and their course, clearly revealed not to be sprue at all, but due in all probability to a bacillus of the dysentery group.

Case 1.—Mr. N. P., European, aged 30, seen by me for the first time in January, 1907. Had been in Ceylon ten years. No previous disease of any kind; denied ever having had hill diarrhœa or dysentery, or any other intestinal affection. When I saw him he had been feeling unwell for about three months; loss of appetite, lassitude, unable to eat spicy foods, which made his tongue and mouth sore; diarrhœa, which at first had been only in the morning, was present later all the day; no pain on passing the motions, which, according to the patient had always been very pale and had never contained blood. The patient was emaciated and extremely anæmic, his skin being of that peculiar pale yellowish colour so common in many cases of sprue, and which makes these patients sometimes appear to have pernicious anæmia; the tongue was absolutely typical, smooth, glazed; a few small painful ulcers were present. The stools were frothy, abundant, and of a whitish colour.

I confirmed the diagnosis of sprue already made by another medical man, and advised the patient to go home. Owing to his precarious financial position he could not do so, and remained in Ceylon. I put him on a strict milk diet and a bael fruit treatment. I examined his stools regularly once a week for three months. They were at first frothy, abundant, whitish, liquid—typical of sprue; there was never any blood or muco-pus present either on macroscopic or microscopic examination; no amœbæ, nor other protozoa. Some yeasts and endomyces-like fungi present. Several times I grew a Flexner-like bacillus which was strongly agglutinated by the patient's blood (1 in 200; 1 in 300). This patient, staying at complete rest on a milk diet and bael fruit, improved greatly, and after three months resumed his duties a different man. He remained under my observation for several months and then left for another tropical Colony. I have heard from him on several occasions till a year ago. He always remained well. During the time he was under my observation in Ceylon the blood continued to give agglutination for the Flexner-like bacillus isolated from the stools, though it decreased in strength; the bacillus could be still occasionally isolated from the fæces.

Case 2.—Mr. S., European, aged 38. Has been one of my patients for several years; I have attended him for malaria, "seven days' fever," and various minor ailments. He never had any trouble with his digestive organs till the beginning of 1907, when he began complaining of slight sore tongue, which I attributed to excessive smoking. On the smoking being given up the condition improved somewhat, then gradually became worse again, the patient being unable to touch curry or any other spicy foods; even light wines induced burning and soreness of the tongue and fauces. The tongue gradually took on the appearance of the sprue tongue, the surface of the organ becoming smooth, almost shiny, and a few small superficial ulcers appeared.

Pari passu with the mouth lesions the patient complained of dyspepsia and flatulence after food, and soon after of slight morning diarrhœa without gripings; the stools at first were somewhat frothy and liquid, but not whitish, later they became typically sprue-like and white, being generally liquid, but at times solid and white, and passed in enormous quantities.

I could never find in the stools the slightest trace of blood or muco-pus macroscopically or microscopically; no amœbæ, no eggs of worms. On three occasions a Flexner-like germ identical to that found in Case 1 was isolated. Agglutination positive 1 in 100.

The patient refusing to go to Europe, I put him on a strict milk diet and bael fruit every morning, and one membroid of 5 gr. of ipecac. at night, a line of treatment I often use in sprue. After a month he was slightly better; I then started a vaccine treatment, having prepared the vaccine from the Flexner-like bacillus isolated from the stools. I gave it in the same manner as in cases of chronic bacterial dysentery as described by me on another occasion (*Journal of the Ceylon Branch* of the British Medical Association, 1905). The vaccine treatment was well borne, and I had the impression that it accelerated the cure; at all events, the patient five months after the beginning of the disease was well and able to do his work. He has remained in perfect health since then.

Case 3.—Mr. C. This case was kindly shown to me by the first physician of the Colombo General Hospital at the beginning of the current year. I agreed with him that it was a typical case of sprue, in fact, I do not think I have ever seen anything more typical: patient very emaciated and extremely anæmic, tongue with smooth, glazed surface. The physical examination revealed anæmic systolic bruit. Liver, by percussion, greatly reduced in size, œdema of both feet. Stools frothy, diarrhœic, often whitish and typically sprue-like, never blood or muco-pus observed by the naked eye. The patient—a very intelligent man—denied ever having had dysentery.

By the kindness of Dr. F. Grenier, I was permitted to examine the stools whenever I desired to do so; macroscopically they never contained blood or muco-pus, they were generally liquid, frothy, but at times semi-solid and whitish. Microscopically numerous yeast-like fungi were present when they were frothy; these fungi were much less numerous when the stools were solid. Only on one occasion I detected in a preparation after a very long search a few red cells

and a few leucocytes.* I never observed entamœbæ or other intestinal protozoa; eggs of worms absent.

The stools were examined bacteriologically and a Flexner-like bacillus was isolated identical to that isolated in Cases 1 and 2. The blood agglutinated strongly (1 in 100) this bacillus as well as other strains of the Flexner group.

The patient left Ceylon, and I have had no other information as regards his progress.

Description of the Bacillus found.—The micro-organism found in all the cases is a Flexner-like bacillus, practically identical to the typical Flexner. Slight differences of very little, if any, importance are found in litmus-milk and in glycerine. In litmus-milk there is persistent acidity instead of the medium becoming first acid and then alkaline. In glycerine there is production of acid, though in small amount. The cultural characters are collected in the following table:—

Motility	Litmus Milk	Lactose	Saccharose	Dulcite	Mannite	Glucose	Maltose	Dextrine	Raffinose	Arabinose	Adonite	Inulin	Sorbite	Galactose	Laevulose	Inosite	Salicin	Amygdalin	Isodulcite	Erythrite	Glycerine	Indole	Voges. Prosk.	Redn. Nitrates	Neutral Red	Gram	Gelatine	Serum	Broth	Pept. Water
0	A	0	0	0	A	A	A	A	A	A	0	0	0	A	A	0	0	0	A	0	As*	+s	0	0	0	0	0	0	G.T.	G.T.

* Distinctly acid on ninth day.

Abbreviations.—A, acid; G.T., general turbidity; s, slight; 0, negative result, viz., neither acid nor gas in sugar media, non-motile, non-liquefaction of gelatine or serum, as the case may be.

Remarks.—Were the above cases true sprue? Or sprue with a superadded infection due to the Flexner-like bacillus? Or were they not sprue at all, but merely cases of bacterial infection due to the Flexner-like bacillus?

In my opinion the cases were not suffering from true sprue, but were merely cases of a bacterial infection due to a Flexner-like bacillus. It seems to me that true sprue can be excluded at least in the first two cases as I have never seen cases of sprue getting completely cured in Colombo. I admit that clinically they were indistinguishable from true sprue, but it must be borne in mind that different germs may occasionally give rise to very similar or identical clinical symptoms. Do not germs of the paratyphoid and Gärtner group give rise at times to symptoms indistinguishable from true cholera? In analogy, bacilli of the Flexner group might under certain conditions induce symptoms similar to those caused by the yet undiscovered germ of sprue.

In the same manner as there is a "choleraic diarrhœa" or a "pseudocholera" from bacilli of the paratyphoid and Gärtner group there may be a "pseudo-sprue" due to bacilli of the Flexner group. The cases I have recorded seem to me to be in favour of this hypothesis.

* In my experience, even in some cases of true sprue in which the bacteriological examination shows absence of amœbæ and dysenteric bacteria, one may occasionally observe microscopically a few red cells in the stools.

THE LIFE OF FILARIAL EMBRYOS OUTSIDE THE BODY.

By George C. Low, M.A., M.D.

Lecturer London School of Tropical Medicine, &c.

In the *Journal of the American Medical Association*, vol. lix, No. 17, October 26, 1912, Wellman and Johns describe, under the rather misleading title of "Artificial Culture of Filarial Embryos," some experiments on the life of filarial embryos outside the body. They found that embryos of *Filaria immitis* will live in sterile defibrinated blood for ten or twelve days at room temperature (28° C.) and that an increase in size occurs, the parasites growing to $1\frac{2}{3}$ their former dimensions. On dextrose dog serum at low temperature (ice chest at 12° C.) the parasites lived from twelve days to two weeks and became 2 to $2\frac{1}{3}$ times as long as when planted. On dextrose dog serum at high temperatures (40° C.) an increase of growth to $1\frac{3}{4}$ times the original length of the embryos was obtained after eight or nine days. Cultures contaminated with bacteria in many instances gave equally good results. The authors state that it is probable that they have by the above methods nurtured the microfilariæ to a point which corresponds with the limit of their development in the digestive tract of the mosquito, and that modifications of their media to simulate the malpighian tubes might ultimately result in the embryos reaching sufficient maturity to make possible the infection of animals from cultures.

The paper is only described as a preliminary note, and in the absence of all details such as measurements, &c., it must not be treated too critically, but at the same time there are certain points in it that require careful comment. Many readers not intimately connected with the changes that take place in the metamorphosis of filariæ in mosquitoes may quite easily be misled, and it is therefore important that the following elementary details should be placed before them.

The fact of filarial embryos remaining alive for long periods of time outside the body is not, of course, a new one. Manson and others have shown that the embryos of *F. bancrofti* will remain alive in ordinary wet blood films ringed with vaseline for days at the ordinary room temperature (winter or summer) or at low temperatures such as in the ice chest. No very appreciable increase in length has been noted in these instances, however, nor any appearances of development.

The increase in length noted by the authors in the case of the embryos of *F. immitis* is probably of a similar nature to that described by Fulleborn and others when embryos of this species or the *Dicrofilaria repens* have been inoculated into clean (uninfected) dogs. In some instances these forms have been recovered in the lungs of the dogs years afterwards, and have then been found to have increased to about twice the length of the originals, but no signs of any development such as takes place in the malpighian tubes of the mosquito have ever been noted.

Be this as it may, the authors' suggestion that the increased length of the embryos corresponds to their limit of development in the digestive tract of the mosquito is manifestly erroneous, for the very simple reason that the embryos migrate immediately from the stomach to the Malpighian tubes. Sections of infected mosquitoes eleven hours after feeding show that the embryos have left the stomach and are already in the malpighian tubes. These, as regards measurements and dimensions, are identical with the form seen either in the blood, in the stomach of the mosquito or in the blood of the definitive host.

Further, the first changes that take place in the embryos in the malpighian tubes are not an increase in length but an increase in breadth, this ultimately forming the sausage stage.

The new point brought out by the authors, namely, the lengthening of dog filarial embryos outside the body of the host, is an interesting fact and is evidently one not in any way connected with degenerative changes, but on the other hand, as the above arguments show, it cannot be looked upon as the first stage of the parasites metamorphosis in the intermediate host, and, therefore, to talk of it as an artificial culture must in that sense be erroneous.

LIVER ABSCESS TREATED BY A MODIFICATION OF THE LEONARD ROGERS' METHOD.

By Lawrence G. Fink, M.B., C.M.Edin.
Civil Surgeon, Myaungmya, Burma.

In 1906, Major Leonard Rogers, I.M.S., recommended treatment of liver abscess by withdrawal of the pus by means of aspiration and injection of a solution of quinine to kill the causative amœbæ. In the *Indian Medical Gazette*, December, 1910, pp. 493-8, he again wrote on the subject, and published statistics showing much better results by this method than by the open method by incision and drainage. He also recommended that pulv. ipecac. should be administered internally as an additional means of killing the amœbæ. In his latest publications on the subject he has shown the marvellous effect of emetine hydrochloride or hydrobromide in amœbic dysentery and liver abscess, and has now recommended the use of these subcutaneously, and also as an injection into the abscess cavity. (*Vide British Medical Journal*, June 22, 1912, pp. 1424-5, and August 24, 1912, pp. 405-8.)

On July 31, 1912, a Karen, male, aged 35 years, was admitted into the Civil Hospital, and a liver abscess was diagnosed. He was in a very emaciated condition, gave a history of dysentery two years ago. Pain in the liver commenced about three months before admission. There was distinct bulging in the lower right intercostal spaces, and much pain on pressure. The temperature was normal, but the patient through pain was unable to get any sleep. He was given pulv. ipecac. 30 gr. twice daily and prepared for operation. First operation done on third day under chloroform. As there was no aspiration available the abscess was emptied by means of a large-sized trocar and cannula inserted in the tenth right interspace in the mid-axillary line. One and a half pints of pus came away. The cavity was then irrigated with salt solution, and the appliance used was the Leonard Rogers' cholera apparatus with the intraperitoneal cannula, which was inserted in the bigger cannula. The former cannula pressed home into the latter prevented the salt solution from flowing out of the abscess cavity till withdrawn. By this means the cavity was thoroughly irrigated with three or four pints of salt solution. Four ounces of bichloride of quinine solution (10 gr. to 1 oz.) were then allowed to run in, the big cannula was removed, and the opening in the skin and deeper tissues closed by a single stitch. On the thirteenth day there was again some pain and bulging, and a similar operation was performed, one pint of pus having been removed. The patient remained free of pain till the twenty-second day, when the third operation was done, 12 oz. pus removed, and the cavity washed out with iodine salt solution (tr. iodine 1 drm., salt solution 1 pint). On the thirty-first day the fourth and last operation was done, and only 6 oz. of pus came away. Iodine and salt solution was again used for irrigation. After each operation quinine bihydrochloride solution 1 oz. was injected. A small trocar and cannula were used for the third and fourth operations. Pulv. ipecac. was also given in 30-gr. doses twice daily at first, and in smaller quantities towards the end. The drug did not cause any gastric disturbance and was well tolerated. The patient was discharged cured on the forty-second day. He has recently been examined, and has had no recurrence. He has put on flesh and appears in good general health. As there was no emetine in stock, and none was got till after the patient was operated on for the last time, it was not used. The patient's temperature was practically normal throughout, there being only two insignificant rises to 99.2° F. on the twentieth and twenty-second days. The pus was sweet throughout except at the third operation, when there was a slight odour. For this reason iodine was added to the salt solution. On the whole the progress of the case was very satisfactory. The patient was able to move about after he had been in hospital for a few days, and the pain was much relieved each time the pus was evacuated. The abscess was undoubtedly a very large one.

This case is reported, not with the object of advocating irrigation of the abscess cavity in preference to aspiration, but merely to suggest an alternative

method when an aspirator is not available, as sometimes happens in outpost hospitals. The operation is so simple that it can be easily undertaken by any sub-assistant surgeon, and may mean saving a valuable life. It can be done with local anæsthesia, and the only instruments and appliances required are a trocar and cannula with a suitable irrigator. The abscess cavity is probably more thoroughly cleared of pus by irrigation than by aspiration. With proper antiseptic precautions there is probably very little fear of bacterial infection. Emetine hydrochloride should now be available in every dispensary, both for the treatment of acute and chronic amœbic dysentery and for use in amœbic hepatitis and liver abscess.

THE METEOROLOGY OF MALARIA.

By MATTHEW D. O'CONNELL, M.D.

IN continuation of my remarks on this subject in the JOURNAL OF TROPICAL MEDICINE AND HYGIENE of August 15, 1912, I am now able to give, through the kindness of the Deputy Director of the Madras Observatory of the Government of India, actual hourly observations of the dry and wet bulb temperatures and the velocity of the atmosphere at Madras from 6 o'clock p.m. on September 21 to 6 o'clock a.m. on September 22, and from 6 o'clock p.m. on September 22 to 6 o'clock a.m. on September 23, 1912; that is, for two nights in what is known as the unhealthy season in India. In parallel columns I will give the nearest atmospheric conditions which were found to raise body temperature in the Lancashire cotton sheds.

Contrasting the atmospheric conditions of the nights of September 21-22 and 22-23, 1912, with those which were found to raise body temperature in the Lancashire cotton sheds, the most obvious points are that while the dry bulb temperatures of each hour of the two nights at Madras are practically identical with those of the observations in the cotton sheds with which they are contrasted, the wet bulb temperatures of the Madras night atmosphere are invariably higher than the wet bulb temperatures in the observations in the cotton sheds. This, of course, shows that while the impediment to loss of heat from the body by radiation is the same in both atmospheres, the humidity, and consequently the impediment to loss of heat from the body by evaporation, is much greater in the Madras night atmosphere, which must therefore raise body temperature more than the cotton shed atmosphere does. But exposure to the cotton shed atmosphere raised body temperature above 37.7° C. (100° F.) in nine of the observations given above. The inference that immersion in the September night atmosphere at Madras must produce pyrexia in a considerable number of the inhabitants is, I think, unavoidable, and as previously pointed out in the JOURNAL OF TROPICAL MEDICINE AND HYGIENE, such pyrexia must necessarily be of intermittent type, quotidian, tertian, or quartan.

Atmospheric conditions during the night of September 21-22, 1912, at Madras					Atmospheric conditions exposure to which raised body temperature in the Lancashire cotton sheds				Degree to which body temperature was raised by such exposure		
	Temperature of air, F.		Velocity of air		Observation	Temperature of air, F.		Length of exposure	Body temperature in mouth, F.	Pulse	Respiration
1912	Dry	Wet	Miles per hour			Dry	Wet	Minutes			
September 21, 6 o'c. p.m.	82.7°	79.7°	3	...	1	83.0°	74.0°	215	... 99.8°	104	21
,, 7 ,,	82.2	79.7	Calm	...	2	82.0	76.0	135	... 99.2	88	14
,, 8 ,,	81.5	79.7	Calm	...	3	81.5	75.5	50	... 100.2	112	31
,, 9 ,,	81.3	79.5	Calm	...	4	81.5	75.5	50	... 100.2	112	31
,, 10 ,,	81.0	79.4	Calm	...	5	81.0	75.0	15	... 100.2	112	31
,, 11 ,,	80.3	79.1	Calm	...	6	80.5	73.0	215	... 99.6	92	20
,, 12 midnight	80.3	78.9	2	...	7	80.5	73.0	215	... 99.6	92	20
September 22, 1 o'c. a.m.	79 8	78.7	1	...	8	79.5	74.5	202	... 100.2	90	24
,, 2 ,,	79.3	78.6	3	...	9	79.5	74.5	202	... 100.2	90	24
,, 3 ,,	79.1	78.2	1	...	10	79.0	73.5	49	... 100.3	110	24
,, 4 ,,	78.9	77.7	1	...	11	79.0	73.5	49	... 100.3	110	24
,, 5 ,,	79.3	78.0	2	...	12	79.5	74.5	202	... 100.2	90	24
,, 6 ,,	79.3	77.8	2	...	13	79.5	74.5	202	... 100.2	90	24

Atmospheric conditions during the night of September 22-23, 1912, at Madras					Atmospheric conditions exposure to which raised body temperature in the Lancashire cotton sheds				Degree to which body temperature was raised by such exposure		
	Temperature of air, F.		Velocity of air		Observation	Temperature of air, F.		Length of exposure	Body temperature in mouth, F.	Pulse	Respiration
1912	Dry	Wet	Miles per hour			Dry	Wet	Minutes			
September 22, 6 o'c. p.m.	82.2°	78.4°	2	...	1	82.0°	76.0°	135	... 99.2°	88	14
,, 7 ,,	80.6	78.1	Calm	...	2	80.5	73.0	215	... 99.6	92	20
,, 8 ,,	79.8	78.0	Calm	...	3	80.0	73.0	120	... 99.2	92	28
,, 9 ,,	79.6	77.8	Calm	...	4	79.5	74.5	202	... 100.2	90	24
,, 10 ,,	79.4	77.7	1	...	5	79.5	74 5	202	.. 100.2	90	24
,, 11 ,,	78.8	77.3	2	...	6	79.0	73.5	49	... 100.3	110	24
,, 12 midnight	78.7	77.1	4	...	7	78.5	73.5	175	... 99.6	116	22
September 23, 1 o'c. a.m.	78.6	77.1	2	...	8	78.5	73.5	175	... 99.6	116	22
,, 2 ,,	78.2	76.1	2	...	9	78.0	73.5	4	... 100.0	100	30
,, 3 ,,	77.5	75.6	6	...	10	78.0	73 5	4	... 100.0	100	30
,, 4 ,,	77.4	75.1	6	...	11	77.0	73.0	180	... 100.1	100	18
,, 5 ,,	77.5	75.1	7	...	12	77.0	73.0	180	... 100.1	100	18
,, 6 ,,	77.5	75.2	3	...	13	77.0	73.0	180	... 100.1	100	18

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THE JOURNAL OF

Tropical Medicine and Hygiene

NOVEMBER 15, 1912.

THE BALKAN WAR.

THE PROBLEM OF DISEASE.

THE several peoples engaged in the great struggle in the Balkans, although dwelling in areas which are outside tropical regions, are yet afflicted with the greatest of tropical scourges, namely, malaria. In Greece, in the low-lying country of the Dobrudja around the mouths of the Danube as it enters the Black Sea, and in many valleys of Albania, Macedonia, and Thrace malaria is present to an extent as pronounced as in the Roman Campagna. To the student of tropical medicine, the virility shown by the combatants in the encounter is little short of marvellous considering the malarial history of several of the peoples engaged. The extent to which malaria prevails in the Balkan States was well brought home to us in the Russo-Turkish War of 1878, when, owing to the great demands for quinine, the price of the drug rose in London by leaps and bounds. Several of the London hospitals issued a notice to their medical staffs that, owing to the high price of quinine, the drug was not to be prescribed except in cases of imperative necessity. So scarce did the stock of quinine become that its price rose in a couple of days as much as 10s. per ounce, until it reached the sum of 17s., and even 19s. per ounce. A more abundant proof of the extent to which malaria prevailed in the area in which war was being waged in 1878 cannot be imagined, and it is in the same area the campaign now in progress is being fought. We have not heard that quinine has risen in price so markedly at present, and from that fact we might conclude either that the countries from which the troops are drawn have become less malarial or that the world's produce of quinine is larger. A circumstance which may have affected the price in London in 1878 was that the Turks knew and appreciated English quinine more highly than any other. Even Bashi-Bazouks knew the bottles of Howard's quinine from any other, and a surgeon who fell into the hands of these irregular horsemen was always well treated if he could present the chief with a bottle of Howard's quinine. Malaria was the great scourge of the armies in 1878, and why one hears so little of it to-day gives food for thought.

It has been said that the downfall of ancient Greece was due to the people becoming infected with malaria, whereby they were so reduced in physical endurance as to be unable to resist the inroads of their neighbours. The decline of the Romans has also been attributed to the same cause, namely, disease produced by malaria. Many parts of Greece and of other countries of South-Eastern Europe are still deeply infected by malaria; and Sir Ronald Ross's account of the extent to which Grecian children harbour malaria to-day, as judged by the splenic index, shows that the prevalence of this disease is severe and widespread. To the lay mind malaria is a local disease which has always prevailed in the countries we know to be infected; this, of course, the student of tropical medicine knows to be an erroneous conception. The infection of Mauritius by malaria in 1866 owing to the importation of Indian coolies is a well-known fact, and one which in our own time has shown us a previously malaria-free country becoming deeply infected. On the other hand, we have seen malaria disappear from South-Eastern England, where, in our grandfathers' times, "the ague" and "ague cake spleens" were as common as in many severely malaria-stricken countries at the present day in the tropics.

In our grandfathers' times, say the beginning of the nineteenth century, the population of England amounted to about thirteen millions of people only, but with the drainage of the swamps and the consequent destruction of mosquito breeding-places malaria disappeared, and the population increased rapidly until, by the beginning of the twentieth century, it had multiplied threefold. Malaria, therefore, comes and malaria goes, and the health and the numbers of peoples rise and fall accordingly. Is the successful rising of the Balkan nations against the Turk due to the fact that the peoples of these countries are emerging from the thraldom in which malaria has held them for so many centuries? This is an interesting question for epidemiologists, and an economic and hygienic study of fascinating interest.

The reported presence of cholera amongst the troops engaged in the campaign in Turkey is calculated to cause the deepest concern not only at the seat of war but to the rest of Europe. The Turkish troops coming from Asia have no doubt brought the infection, and the disease will find a nidus calculated to favour its spread. Overcrowding, the insanitary conditions attendant upon all wars, but especially in the unwholesome environment of Constantinople —the interference with the water supply of the city by the enemy will drive the people to use water from wells which have long been in disuse—and the inefficient disposal of sewage are all calculated to favour the spread of cholera. There is therefore the dread of a great impending calamity, and the possibility of the spread of the disease in many directions as the troops return to their several countries. The fact that winter is upon us will not serve to lessen the chance of cholera spreading. Cholera has been rife in Russia when the snow covered the country; for as the excreta are thrown around the house, and as the water for the household supply is obtained by melting the snow near by, the snow becomes polluted and the water supply is contaminated, and cholera infection is maintained. A great scourge may therefore be upon us, and it will be well to be prepared to guard against the widespread infection of Europe from this the most acute of all scourges.

Typhus fever almost invariably appears amongst armies during campaigns conducted in very cold weather. The disease is due to one cause, overcrowding, and in large armies in winter it is difficult to prevent men huddling together for the sake of warmth, or from being condemned to crowd into one tent or dwelling owing to the difficulty of providing accommodation. In the Crimean War during winter typhus fever proved a veritable scourge; the overcrowded tent was the cause. Sixteen men to a bell tent; the frozen canvas covered by snow became impervious to air; the door (flap) of the tent kept shut except when a soldier had to go or come for duty gave an atmosphere of deadly properties, and typhus fever resulted. The chief danger of typhus will be in Constantinople, whence refugees from a hundred miles round are hastening, and should in addition over half a million soldiers, victor and vanquished, find their way after the fight is over into the town, the overcrowding will be serious. This combined with the well-known insanitary condition of Constantinople is calculated to generate disease, of which typhus fever is the expression and the outcome. Typhoid, or as it is still called on the Continent, "typhus abdominale," indicating that it is associated with typhus, is prevalent in South-Eastern Europe at all times, and that it should prevail during the turmoil of war when hygienic laws are difficult to enforce is readily understood. Enteric in the South African War was the soldier's most deadly enemy. Here was an open country; habitations were few and wide apart; the campaign was conducted in a country as large as half Europe; every appliance and scientific method known to man was available to maintain the health of the soldiers, yet did enteric prevail to an extent not exceeded in any campaign of which we have any historical knowledge. The period of epidemic typhoid in South-Eastern Europe is not yet, but when the shot and shell have done their work, when typhus has swept off its thousands from overcrowding, then will the pollution of the earth and the water tell its long-drawn-out tale; and for many months after the last shot is fired will enteric fill the hospitals and carry off its victims.

The efforts of the British Red Cross Society in their endeavour to send *personnel*, medical, and surgical aid and equipment have been timely and efficient; and it is imperative if real good is to be done that cognizance is taken by the Society and the public that the declaration of peace does not end the soldiers' sufferings; but that for many months afterwards the illnesses attendant upon war continue and require all the help that this and other nations can bestow upon the sick and suffering.

J. CANTLIE.

Annotations.

Yellow Fever.—Seidelin, in his report of the Liverpool School of Tropical Medicine Yellow Fever Expedition to Yucatan, 1911-1912 (28th Expedition of the Liverpool School of Tropical Medicine), states in his summary that *P. flavigenum* (the bodies which the author supposes are the parasites of yellow fever) was found in practically all cases of yellow fever. It was also found in two apparently healthy native children, but not in other febrile diseases. The author therefore considers it the pathogenic parasite of yellow fever. Yellow fever, the author further states, is endemic in Yucatan, and, probably, in Campeche and in Quintana Roo. The disease attacks natives, generally as children and in mild, atypical forms, but occasionally in severe, even fatal, forms, typical or atypical. Cases in foreigners are often severe.

Diphtheria in Manila, P.I.—The United States Public Health and Marine Hospital Report for June 14 shows that diphtheria in the city of Manila has been increasing. Previous to the American occupation there are no records, but local physicians state that they know of very few cases during Spanish times. The number of cases has risen steadily from 1 in 1900 to 28 in 1910 and 25 in 1911. No doubt it has been introduced from time to time by sailors and soldiers who have acted as carriers of the disease. Also diagnosis is now more sure, as a bacteriological examination can now be made. From June 30, 1911, to April 2, 1912, there have been reported in the city of Manila 39 cases with 12 deaths, a case fatality of 30.77 per cent. This severity is due to the indigent sick not calling for medical aid until too late, even although diphtheria antitoxin is available. The type of disease is mostly pharyngeal. It is interesting to note that 25 diphtheria carriers have been found amongst contacts.

These bacillus carriers are always isolated in the communicable-disease hospital, as are cases of the disease itself, and are detained in the hospital until two successive negative cultures have been obtained. In no instance has a bacillus carrier developed the disease. A complete set of regulations has been drawn up to govern the action of the medical officers in dealing with the disease.

Sensory Perceptions in Ticks.—Hindle and Merriman, in a paper on the sensory perceptions of *Argas persicus* (Oken)* come to the following conclusions :—

(1) "All stages of *A. persicus* are negatively phototropic. In addition, they are also susceptible to pronounced differences in the intensity of the illumination and select the darker places.

(2) "In the gorged state, the ticks are slightly positively geotropic. In the unfed state, this property is not developed.

(3) "At all stages the tick endeavours to bring as much of its surface as possible in contact with its surroundings.

(4) "*A. persicus* is attracted by heat.

(5) "In all stages an olfactory sense is well developed.

(6) "'Haller's organ' is olfactory in function and constitutes a means by which a tick is able to recognize its host. By depriving ticks of this organ it is possible by suitable means to cause them to feed on media other than blood, thus showing that a sense of taste is absent. *A. persicus*, *Ornithodorus moubata* and *Hyalomma ægyptium* have all given similar results with regard to the latter point, and the authors believe that this constitutes a method by which perhaps other blood-sucking arthropods, after being deprived of the organ or organs necessary for the recognition of their hosts, may be made to feed on any desired medium."

The Treatment of Hydatid Cysts in the Lungs.—Griffiths, writing in the *Australasian Medical Gazette* (September 28, 1912) on hydatid cysts of the lung, lays down the following dicta as regards treatment: "Exploratory puncture is not advisable except as a preliminary to thoracotomy. Where the cyst is close to the surface of the lung, the operation described by Lendon is dangerous, but may be advisable; if the cyst be deep-seated it is hard to reach, and the great risk of death following operation makes it more prudent to adopt an expectant plan rather than to undertake an operation so very dangerous. Possibly, the use of Saurbruch's pressure chamber may reduce the risk. It is true that Davies Thomas and Lendon, and more recent writers, have recorded numerous successes after incision, but how many fatalities have resulted from operation? Some surgeons have been brave enough to record them, but the vast majority go unreported. In cases of purulent hydatid cavity, if antiseptic inhalations (creosote, &c.) fail, thoracotomy may become advisable. Dieulafoy, Tremearne, Thane, and others have recorded cures by aspiration and injection of antiseptics, but the risk of this procedure makes it inadvisable to adopt it. It not infrequently (according to West, in 70 per cent. of cases) happens that the disease, if left alone, terminates in a cure either by death of the parasite and inspissation of the contents, or by rupture into the bronchus and vomica. It is possible that intravenous injection of salvarsan might prove an efficient anthelmintic." Atoxyl has been tried.

* *Parasitology*, vol. v, No. 3, September 28, 1912.

Nile Boils and their Treatment.—Archibald in the *Journal of Vaccine Therapy* (vol. i, No. 11, November, 1912) gives a description of Nile boils and their treatment. He states that the essential causal organism of the Nile boil is a staphylococcus, which can be isolated as a rule in pure culture from the boil during any of its stages. A careful search has been made by means of dark field illumination methods to determine whether spirochætes or other causal germs are present, but always with negative results. Deep punctures of the boil have been made by means of sterile pipettes in order to note the presence or absence of protozoa, but in no case have these been found. In the Sudan the commonest organism found in the Nile boil is the *Staphylococcus pyogenes aureus*, *S. pyogenes albus* comes next in frequency, and recently on three different occasions the author has obtained *S. pyogenes citreus*.

As regards treatment this is carried out by staphylococcic vaccines.

The dose for adults is 250 million for an initial dose, followed, four days afterwards, by a dose of 500 million and then a weekly injection of 500 million till six doses in all have been given. In young children doses of 2 million and upwards are employed. Pregnancy does not appear to be a contraindication for the treatment.

As a rule a cure is generally effected after three or four doses but the patient is advised to carry out the full number of injections so as to be provided with a more lasting immunity. The reaction obtained is less severe than when larger initial doses are given and the results have been extremely satisfactory. There is a marked improvement in the general health of the patient, and one of the first things observed is the tendency for recurring boils to abort.

The Cultivation of Malarial Plasmodia.—Bass and Foster write more fully on this subject in the *Journal of Experimental Medicine*, vol. xvi, No. 4, October 1, 1912. The subject has already been dealt with from time to time in the JOURNAL OF TROPICAL MEDICINE AND HYGIENE. The general conclusions of the authors are as follows: The asexual cycle of *Plasmodium vivax* and *Plasmodium falciparum* has been cultivated *in vitro* in human blood. The parasites have also been grown in red blood corpuscles in the presence of Locke's solution, free of calcium chloride and in the presence of ascitic fluid.

They grow within red blood cells and there is no evidence that they can be grown outside of these cells.

They are destroyed in a very few minutes *in vitro* by normal human serum or by all modifications of serum that have been tested. This fact, together with numerous observations of parasites in all stages of growth apparently within red cells, renders untenable the idea of extracorpuscular development.

Leucocytes phagocytize and destroy malarial plasmodia growing *in vitro* only when the parasites escape from the red blood cell or when the latter is perforated or becomes permeable.

Successive generations of *Plasmodium vivax* and *Plasmodium falciparum* have been cultivated *in vitro* by removing the leucocytes from the culture and by transplanting to fresh red blood cells and serum at proper intervals.

The asexual cycle of *Plasmodium vivax* and *Plasmodium falciparum* cultivated *in vitro* does not differ from the same cycle growing *in vivo*. The sexual cycle has not been cultivated, though the authors have obtained some evidence of the possibility of its accomplishment.

There can no longer be any doubt, they think, that *Plasmodium vivax* and *Plasmodium falciparum* are separate and distinct species. When grown in an identical culture medium and under exactly the same conditions they remain distinct.

In twenty-nine cultures of æstivo-autumnal parasites many forms and sizes were observed, so that evidence is supplied of the occurrence of different varieties of æstivo-autumnal malarial plasmodia. The so-called tertian æstivo-autumnal variety may be seen at the proper stage in all cultures grown from merozoites.

The form and appearance of the same culture of plasmodia may vary greatly under different conditions which are not necessarily destructive to the parasites. Their generation period may vary from thirty hours (æstivo-autumnal) to four days (tertian), as a result of variation in the temperature at which they were cultivated. Sexual parasites grow in the cultures and are more resistant to unfavorable conditions than schizonts, often living several days after the latter die out.

Forms suggesting parthenogenesis have been observed.

The Morphology of Trypanosoma gambiense *and* T. rhodesiense *in Cultures.*—J. G. Thomson and Sinton publish a very interesting paper in the "Annals of Tropical Medicine and Parasitology" (Series T.M., vol. vi, No. 3, B. October 18, 1912), on the "Morphology of *T. gambiense* and *T. rhodesiense* in Cultures, and a Comparison with the Developmental Forms described in *Glossina palpalis*." The medium used for the cultivation was a modification of the Novy-MacNeal-Nicolle medium (Nicolle, 1908), made by substituting for defibrinated rabbit's blood citrated rat's blood heated to 45° C. for half an hour, and by using sea salt for ordinary sodium chloride. This was found suitable for cultures and subcultures of both species. The authors' summary and main conclusions are as follows:—

(1) *T. gambiense* and *T. rhodesiense* are capable of being cultivated on artificial media. *T. gambiense* has been cultivated for a period of thirty-seven days, and during that time was carried through four generations by means of subcultures. *T. rhodesiense* has been more difficult to cultivate, and has continued to develop for only twenty-one days. All the flagellates disappeared in the third subcultures.

(2) The life-history of these trypanosomes in culture tubes is similar to that which occurs in the gut of the insect host. This is shown by a comparison of the morphological characters of *T. gambiense* in cultures with those forms found by Bruce and his colleagues in *Glossina palpalis*. Developmental forms found in the culture tubes are identical in their chief characteristics with those described in the gut of an infected tsetse-fly.

(3) The cultures of *T. gambiense* and *T. rhodesiense* quickly lose their infectivity, and intraperitoneal injections of these into rats after the third day have been unsuccessful in causing an infection. This the authors have shown to be comparable to the results of Bruce and his colleagues, who have found that the intestinal contents of *G. palpalis* quickly become non-infective. The infectivity during the first few days appears to be due to the persistence of some of the original blood forms. In successful cultures, therefore, infectivity ceases as soon as these blood forms disappear and the "healthy developing forms" which are non-infective appear.

(4) Cultures of *T. gambiense* and *T. rhodesiense* have remained non-infective after the third day, this probably being explained by the fact that infective forms such as are found in the salivary glands of *G. palpalis* did not occur in the cultures. It is possible that some transference of the cultures to a new medium or environment similar to that of the salivary glands of the tsetse-fly might be required to permit the full life-history of the trypanosomes being completed.

(5) Cultures of *T. rhodesiense* seem to differ from those of *T. gambiense*. In cultures of the former typical posterior nuclear forms such as described by Stephens and Fantham are relatively common, whereas in the latter they are of very rare occurrence.

(6) Although the so-called "male" and "female" forms are present in cultures the authors could not find any definite evidence of a sexual cycle.

The Health of the Canal Zone.—Gorgas reports that for the month of July, 1912, the total number of deaths from all causes among employees in the Canal Zone was 42, divided as follows: Disease 32, and violence 10, giving the annual average per thousand of 7.88 and 2.46 respectively.

Among employees for the month of July of each

year the annual average death-rate per thousand was as follows:—

1904	...	...	6.24
1905	...	...	31.54
1906	...	...	64.71
1907	...	...	35.09
1908	...	...	14.68
1909	...	...	8.10
1910	...	...	11.80
1911	...	...	14.06
1912	...	...	10.34

The annual average death-rate per thousand in the cities of Panama and Colon and the Canal Zone, including both employees and civil population for the month of July of each year, was as follows:—

1905	...	...	58.14
1906	...	...	67.72
1907	...	...	41.46
1908	...	...	29.11
1909	...	...	18.29
1910	...	...	22.48
1911	...	...	26.53
1912	...	...	23.55

In segregating according to race, the annual average death-rate per thousand from disease among employees was: For whites 6.98, and for blacks 8.18, giving a general average for disease of 7.88. For the same month during 1910, the annual average death-rate per thousand from disease among whites was 9.51, and blacks 9.16, giving a general average of 9.25; and in 1911 from disease among whites 10.37, and blacks 10.27, giving a general average of 10.29.

Among employees during the month, deaths from the principal diseases were as follows: Dysentery, entamœbic, 1; hæmoglobinuric fever, 1; lobar pneumonia, 6; malarial fever, æstivo-autumnal, 2; and tuberculosis, 9, leaving 13 deaths from all other diseases, and 10 deaths from external violence.

One case of yellow fever on a ship from Guayaquil, Ecuador, was isolated in Santo Tomas Hospital, and died there on July 14. With this exception no case of yellow fever, small-pox, or plague occurred on or was brought to the Isthmus during the month.

Dysentery in India.—Captain Wells, I.M.S., reports in the *Scientific Memoirs by Officers of the Medical and Sanitary Departments of the Government of India* (New Series), No. 52, on dysentery in the Hazaribagh Central Gaol, January, 1910—March, 1911. His conclusions, which are interesting, are as follows:—

(1) That dysentery exists in this gaol as a chronic recurrent disease with a period of maximum prevalence during the rainy season, and not in an acute epidemic form.

(2) That in a small proportion of cases only were organisms isolated belonging to the group of the *Bacillus dysenteriæ*.

(3) That, of the bacilli isolated from fourteen cases, nine were mannite-fermenters and five did not ferment mannite; within these two sub-groups there were, again, minor differences.

(4) That the agglutination reaction appears to be of little value in the diagnosis of infection with organisms of the *B. dysenteriæ* group.

(5) That amœbæ can commonly be cultivated from fæces, tap water, and other materials by planting them on Musgrave's medium contained in Petri plates.

(6) That amœbæ of similar characters to those found in cultures from stools are, in this part of India at any rate, common inhabitants of the air, just as are moulds and other bacteria; at least two distinct types of the amœbæ may be distinguished.

(7) That these contamination amœbæ may readily gain access to specimens of fæces, however carefully collected, specimens of pus or other material which has, either before or after removal from the body, been exposed to the air, and to any material after it has been planted on Musgrave's medium contained in Petri plates.

(8) That the presence of amœbæ in cultures from stools on Musgrave's medium contained in Petri plates is no sound evidence of an original infection of the intestine with these organisms.

(9) That in 19.5 per cent. of the cases motile amœbæ were found in the stools on microscopic examination.

(10) That these intestinal amœbæ are excreted intermittently; hence several negative results of microscopic examination do not exclude the existence of an amœbic infection.

(11) That the amœbæ observed microscopically in the stools present different characters from these cultivation amœbæ, but resembling those described for the vegetative forms of *E. histolytica* (Schaudinn).

(12) That this amœba does not appear to live beyond a few hours after discharge from the body, whether the fæces containing it are transferred to Musgrave's medium or not.

(13) That tuberculosis of the large intestine accounts for a small proportion of dysentery cases.

(14) That there remains a large proportion of dysentery cases in which at present no definite causal factor can be recognized.

(15) That a mild ankylostoma infection is common, but that no serious morbid changes could be traced to it.

(16) That in cases of dysentery a marked leucocytosis may occur in the absence of any evidence of complication.

Sleeping Sickness in Nyasaland.—Hearsey, in his "Diary on Sleeping Sickness in the Nyasaland Protectorate" (part xvii), gives further details of the spread of the disease in these parts.

Thirteen additional cases have been notified during the past quarter, namely, one in April, three in May, and nine during the month of June. These, added to

the sixty-three cases previously recorded, now bring the total up to seventy-six.

Further two cases have been reported from Portuguese East Africa. A detailed account of one of these is given from notes furnished by Dr. Stannus, under whose care the patient came. As these notes are very thorough, and may be useful to others who may meet with similar cases, we quote them in detail.

"Mr. E., aged 26, of New Zealand, a professional elephant hunter.

"Seen on May 18, 1912, in Zomba, whither he had come to seek treatment for an illness which had lasted several weeks; he gave the following history of his illness:—

"On April 2, 1912, the patient noticed what he called a pimple on the left side of the back of the neck; the following day this had increased in size accompanied by a good deal of inflammatory reaction.

"On the 4th patient began to feel ill, the swelling was more marked and there was a good deal of throbbing pain; thinking that an abscess was forming he attempted to incise the swelling but found no matter. The same day he became very ill with a high temperature; he recognized that he was suffering from some disease that was new to him and not malaria. During the next few days the temperature remained high; since then there has been a daily rise towards evening to about 102° F., though about normal in the morning. Wasting and loss of strength have been progressive and rapid. Constipation has been most obstinate, with pain and abdominal distension to a marked degree.

"On May 10 the feet began to swell, reaching a maximum on the day of arrival in Zomba. Since the beginning of the illness there has been no pain in the head or elsewhere; no rash has been noticed on the body, and there has been apparently no enlargement of the superficial lymphatic glands. He complains that he has been very much troubled with sleeplessness all along, and since May 10 has had a cold in the nose followed by cough; during the same time he became deaf.

"On examination, patient is seen to be considerably wasted; this is marked all over the body but disguised in the lower limbs by the œdema which involves both feet and reaches halfway up the legs; in the same way wasting of the abdomen is masked by a considerable degree of distension. The spleen is much enlarged. Anæmia is marked and the face presents a peculiar but characteristic expression and pallor. There is no rash on the body except some superficial ulcerations on the palmar aspects of the hands and fingers which have, however, more the appearance of so-called fever sores. There is no characteristic enlargement of lymphatic glands, there being but one very small gland in the supraclavicular fossa of the left side; there is, however, some thickening in the position of the recent inflammatory swelling in the neck, apparently of subcutaneous tissue. The abdomen is tensely distended, though not otherwise resistent to palpation; the liver is not felt to be enlarged. Cardiac dulness is a little increased; at the apex and thence diffused over the cardiac area is heard a rather loud systolic murmur which accompanies but does not replace the first sound. Over the bases of the lungs there are a few moist sounds heard, but otherwise the lungs are normal. There is no mental impairment and no sign of involvement of the nervous system. Blood examination reveals the presence of trypanosomes. Auto-agglutination is well marked. In stained smears the organism is seen to be polymorphic, long free flagellated forms, slender forms, stouter types with no free flagellum and dividing forms are seen. They number twenty to thirty per slide. No malarial or other parasites noted.

"The history of the case shows that Mr. E. had been shooting in the neighbourhood of Mtarika, on the Lujenda River, between Lake Amaramba and the Ruvuma River in Portuguese East Africa, for several months before the present illness. On March 31 he moved from his camp at Mtarika to the Uliku River, April 2 being the date on which his present illness began. In the country around Mtarika tsetse flies (stated to be *Glossina morsitans*) are numerous, while at the Uliku River there are few, if any. From the above it will be seen there can be little doubt that infection was contracted in the neighbourhood of Mtarika. The history of onset bears a very close resemblance to that of cases infected in this country and in N.E. Rhodesia and one may reasonably assume that the approximate date of infection was some ten to twenty days prior to the date of his first symptoms. Again, as far as our present knowledge goes, while *G. morsitans* is present in numbers *G. palpalis* is absent, and it is a fair assumption that the former is the agent in this case; the course of the disease is also similar to that noted in cases infected in this country and in Rhodesia, and there can be little doubt but that the trypanosome in this case will be found to be the same, that is to say *Trypanosoma rhodesiense* and not *T. gambiense*. A monkey inoculated from the patient, and which became fairly heavily infected, showed a small percentage of the "posterior nuclear" forms described by Stephens and Fantham as characteristic of *T. rhodesiense* the infective agent in a case of trypanosomiasis from N.E. Rhodesia, and found by myself in subinoculated animals in a case infected in Nyasaland, a point which practically settles the identity of the trypanosome in the present case. Two dogs were inoculated with the patient's blood and dispatched to the Director of the Scientific Commission for further investigation. As pointed out elsewhere the symptomatology is characteristic: a history of fever of several weeks, associated with rapid anæmia and wasting, with œdema of feet and a peculiar facies which is pathognomonic of this infection. This case also adds another to those with a history of an acute local inflammatory swelling of the skin of the neck. As far as one is aware this is the first case to be reported from Portuguese East Africa, and its importance is therefore far-reaching. Information has since been received that the German Government have a sleeping sickness camp on the Ruvuma, so that it seems not unlikely that a large area to the east of Lake Nyasa is infected. The

patient's more remote history shows that six years ago he visited N.E. Rhodesia; a little under a year ago he was at Lake Rukwa, but during the past six months he has been constantly on the Lujenda River. Inquiry to elicit whether he could have become infected from natives from other known infected areas has proved negative. He had in his employ several Awemba, but neither these nor any of his boys or men were at any time sick. Three men from Fort Johnston district who were with him have since been examined but with negative results. Further history of case: Within two hours of the diagnosis being confirmed the patient was admitted to the European Hospital, Zomba, and atoxyl 5 gr. injected deeply into the muscles of the buttock without any constitutional reaction. On the following days trypanosomes were still fairly numerous; abdominal distension and discomfort very troublesome, and cough worried patient at night. These symptoms, accompanied by a rising temperature, continued till the 22nd, when a second injection of atoxyl was given. The following day (23rd) the temperature had fallen below normal but trypanosomes were still present. Œdema of abdominal wall and face had appeared; these signs with moist sounds at bases of both lungs and very loud cardiac murmurs more marked on the 24th; a petechial rash had appeared on the abdomen and back, the result of the œdema. On the 25th moist sounds in the lungs were less and the cough easier. On the 26th œdema of scrotum appeared. All these symptoms persisted and patient in no way improved. He was very restless at night, the abdominal distension became very general and marked in degree, despite diet and salines; relief was obtained by vomiting either naturally or induced by patient. Trypanosomes always present in blood. Temperature showed a daily rise to between 100° and 101° F. On the afternoon of the 29th an intravenous injection of tartar emetic 2 gr. was given. This was immediately followed by some respiratory distress, nausea, flushing of face and paræsthetic sensations over the whole body, followed one hour later by a rigor, temperature reaching 102.8° F. at 6 p.m. Pulse 122, restlessness and bounding heart beat: these continued till 3 a.m., by which time the temperature had fallen to 97.6° F., pulse 88, and patient fell into a quiet sleep. On the morning of the 30th improvement in other symptoms commenced, and on the 31st no œdema was noted; abdomen but little distended and no discomfort complained of. Heart beats less violent and cardiac murmurs less marked, and patient more comfortable than he had been for weeks. No trypanosomes were found in the blood.

"On June 1 temperature rose again, reaching 101.4° F.; labial herpes appeared, followed by a restless night and reappearance of trypanosomes in small numbers in the blood the following day; patient very depressed, pulse very rapid and feeble but no swelling of legs or abdomen. Atoxyl given as before with no visible effect. On June 3 a small gland in the right axilla and another on right side of neck tender. Herpes spreading over lips. June 4 distension of abdomen became troublesome again and trypanosomes in small numbers were still present in the blood. Atoxyl as before was given.

"The patient left hospital for England on June 20."

On arrival there he underwent a further course of treatment at the London School of Tropical Medicine, but ultimately died on the Continent."

The Cultivation of Spirochæta gallinarum.—Noguchi reports the successful cultivation of *Spirochæta gallinarum* in the *Journal of Experimental Medicine* (vol. xvi, No. 5, November 1, 1912). He states that this parasite can be cultivated in suitable artificial media for many successive generations, and probably for indefinite periods. The presence of fresh tissue and a certain amount of oxygen seems to be essential for its growth. No perceptible odour is produced in the cultures. The maximum growth is reached on about the fifth day, but the phase of degeneration commences slowly and gradually, so that in this respect the *gallinarum* differs from the *duttoni, kochi, obermeieri,* or *novyi,* whose cultures are characterized by sudden onset of degeneration soon after the maximum growth is attained. No rod formation resembling bacilli arises in the course of multiplication. Many round or oval bodies appear in old cultures, but no infection of animals or formation of spiral forms from these granules has been produced. The granules are probably the degeneration products derived from the periblast of the spirochætæ.

Cultures of *Spirochæta gallinarum,* either old or young, do not contain forms which pass through a Berkefeld filter. The cultures remain virulent for chickens for at least thirteen generations, but they may become avirulent under certain conditions. The inoculation of chickens with attenuated cultures renders the birds refractory to the subsequent infection with a virulent strain. When the spirochætæ are cultivated in a media containing rabbit's kidneys instead of chicken's muscle, the individual specimens are somewhat thicker, but otherwise typical.

Division is transverse, no positive evidence of longitudinal division ever having been obtained.

Sporotrichosis.—Hamburger gives a summary of sporotrichosis in man in the *Journal of the American Medical Association* (vol. lix, No. 18, November 2, 1912). He adopts Beurmann's classification for the clinical varieties of the disease as follows:—

(1) Localized sporotrichosis with sporotrichotic chancre and ascending lymphangitis and local lymphadenitis.

(2) Disseminated gummatous sporotrichosis; multiple subcutaneous nodules distributed without systematic arrangement throughout the body; early small hard, painless round masses; late small and large soft, cold abscesses. *No ulceration.*

(3) Disseminated ulcerative sporotrichosis; multiple polymorphic ulcerations of the nature of

tuberculous, syphilitic, ecthymatous, rupial or furuncular lesions or a mixture of these.

(4) Extracutaneous sporotrichosis, with localization in mucous membranes, muscles, bones, joints, ocular tissues, synovial membranes, kidney, and lungs.

The disease occurs in men between the ages of 15 and 45 in the country and farming districts, in farmers, fruit and vegetable dealers, berry-pickers, florists, &c. It has also been noted in cities, however. A history of trauma by nails, wire, knife, hammer, bite of animals (rat, hen), pin-prick, &c., precedes the onset. Incubation is slow, the onset insidious, and the clinical course long drawn out. The diagnosis is verified by the cultivation of the organism on artificial media, the *Sporotrichium* being characterized by its slow initial appearance; its ready growth on 2 per cent. glucose agar at room or incubator temperature; its raised corrugated appearance on slant agar and its radiating, flower-like appearance in stab culture; its brownish-black pigment production in old cultures and on 4 per cent. glucose agar; its branching septate mycelium and pear-shaped spores.

Beurmann's treatment is as follows: "Potassium iodide should be administered internally in increasing doses as high as 6 grm. a day and even more, and the local lesions should be dressed with a weak iodide solution: water, 500 grm.; potassium iodide, 10 grm.; iodine, 1 grm. Finally, the ulcerated points should be cauterized with tincture of iodine. The prolongation of general treatment for a month after complete, apparent recovery is indispensable to prevent relapse and recurrences."

Ankylostomiasis Anæmia.—Nicoll, writing on the anæmia of ankylostomiasis in the *British Medical Journal*, October 26, 1912, concludes:—

(1) That hookworm disease in dogs is not analagous to hookworm disease in man. In the latter the disease is essentially chronic and progressive, gradually leading to a fatal termination. No great degree of resistance appears to be acquired, although some individuals are apparently less susceptible to infection than others. Again, individuals of all ages are equally liable to acquire infection. In the dog, however, the disease is very acute and rapidly fatal. While all dogs appear to be liable to a greater or less degree of infection, only young dogs (under 6 months) succumb to the disease. In older dogs infection cannot be pushed beyond a certain point, even with long continued administration of infective material. In those a certain degree of anæmia is slowly produced, but it is also gradually recovered from, and the animal may regain its normal state, even although it remains infected with the worm, which infection, it may be added, may last over two years.

(2) That the anæmia in young dogs is characterized by great loss of weight, emaciation, prostration, intestinal hæmorrhage, greatly reduced temperature, and accelerated and irregular cardiac beat. These symptoms were present to a less extent in older dogs suffering from a minor degree of anæmia. In the latter the erythrocytes were rarely reduced in number to any great extent, but the hæmoglobin fell in some cases as low as 50 per cent. of normal. In the acute disease of young dogs, however, the erythrocytes were observed under one million per cubic millimetre, and the hæmoglobin 10 per cent. In both cases the blood picture was characterized by the large number of erythroblasts, not infrequently of large size, and polychromatophilia. Eosinophilia was not a constant sign either of infection or of disease, and, in fact, was observed only on a few occasions.

(3) That infection is generally accompanied by fairly profuse intestinal hæmorrhage, which is most marked in the early stages, and tends to disappear later.

(4) That the blood volume of dogs suffering from a minor degree of hookworm anæmia is not materially altered, but, if anything, is somewhat diminished. The oxygen capacity of the blood per unit of body weight is also, on the average, somewhat decreased. In the acute stage of the disease the blood volume appears to be decidedly reduced.

(5) That in the early stages of infection the worms attach themselves to the lower reaches of the ileum, but in the course of time they are found further forward.

(6) That cats are much less easily infected than dogs, while monkeys and man were found to be insusceptible to infection with the canine hookworm.

The Length of Life of the Rat-flea.—Nicoll, writing on this subject,* states that rat-fleas (*Ceratophyllus fasciatus*) were removed from their host and kept under various conditions of light, temperature, moisture, &c., in order to determine their length of life without feeding. Altogether sixty-four experiments were performed, involving a total of 463 fleas. The average length of life at ordinary temperatures was found to be 6.8 days, but the maximum in one experiment was over forty days. Two per cent. of the fleas lived for over three weeks, and 10 per cent. for over a fortnight. They live longer in winter than in summer, the difference being about two and a-half days on an average. At very low temperatures (0° to 8° C.) their life may be prolonged to over two months. Both excessive moisture and excessive dryness are inimical, but a certain amount of moisture is beneficial. Darkness does not prolong their life, for those which were kept in bright daylight lived, on an average, longer than those kept in the shade or in darkness.

It was further found that fleas may remain in the larval and pupal stages for much longer periods than normal under certain circumstances. Several experiments were made to determine this point. In the first, material containing fleas was removed from a rat cage and isolated. It was observed to remain

* *Brit. Med. Journ.*, October 26, 1912.

infected with fleas for a period of over five months. A second experiment continued to produce fleas for a period of eleven months. In a third experiment this period was extended to fourteen months. Some fleas in this experiment at the end of a year were placed along with a young rat, and in three months they had multiplied very considerably.

From these experiments it is evident that the larval and pupal stages of the rat-flea, which normally last from two to six weeks, may be prolonged to over a year. As seen in the first set of experiments, the length of life of an adult flea under these conditions is generally under a month, and no evidence was obtained that the fleas multiplied during the period, although this may be possible; so that it may be concluded that the appearance of adult fleas after such a long period as a year was due to the larval and pupal stages being prolonged.

The importance of these observations to preventive medicine lies in the fact that as fleas are carriers of disease, it may be, and is, of considerable moment to determine exactly how long they can exist under various conditions. A full account of these observations is being prepared for publication.

Abstracts.

The Opsonic Index in Plague Vaccination.*

By Ralph St. John Brooks, M.B., D.P.H.

The scope of this inquiry resolved itself into the following points:—

(1) Is there any correlation between immunity and opsonic production in plague infection?

(2) What is the influence of previous vaccination in the experimental animal?

(3) What is the source of opsonin in immune plague serum?

Methods of Experiment.—In all cases Klein's dilution method was employed. A strain of a virulent plague bacillus killed in 50 per cent. formalin solution was employed in the opsonic technique. The nucleo-protein used as a vaccine was prepared in the manner described by Rowland in the *Journal of Hygiene*. The bacterial emulsions were prepared with twenty-four hours agar slopes. The pooled serum of ten rats was used in each experiment.

After a series of experiments on rats and human experiments the author's conclusions are:—

(1) The substance which produces a rise in the opsonic index in immune pest serum is the nucleo-protein contained in the bodies of the bacilli.

(2) The washed bodies of the bacilli when used as a vaccine do not cause any increase in the opsonic index.

(3) Within limits, the larger the dose, the greater the opsonic response.

(4) A repeated dose of vaccines raises the index above the maximum of the first inoculation, even after the curve has fallen to its normal level.

(5) In the early stages, in rats, the opsonic response and the degree of protection aroused rise together.

(6) In human beings the maximum response is observed to be much later than in the case of laboratory rats, and the response in a series of previously sensitized persons is somewhat greater than in a series of persons not previously vaccinated.

(7) The local and constitutional effects of nucleo-protein vaccination compare very favourably with those observed in other methods of protective inoculation.

* *Brit. Med. Journ.*, October 26, 1912.

Pellagra in the British Islands.*

By Louis W. Sambon, M.D., F.Z.S.,
and
Albert J. Chalmers, M.D., F.R.C.S.

In this careful and interesting paper the authors note that though pellagra is clinically well characterized, and is of great importance in that it is a deadly disease, yet it is one which escapes recognition easily, because it varies greatly in the nature, sequence, and intensity of its symptoms; because it may remain clinically latent for years in the patient, and epidemically dormant for long periods in a given region; because it avoids crowded cities and, as a rule, strikes the uncared-for peasant in remote country districts; because it principally affects the young with manifestations usually so mild that it is either overlooked or unheeded; because it breaks out in the mature and elderly under stress of lowered resistance, following in the wake of poverty and famine, and engrafting itself on to other diseases; and because it may be concealed with shame as the brand of destitution and madness. The disease is a prolific, though often unrecognized, cause of insanity. It is difficult to trace far back the history of indubitable pellagra, because, in the past, it was confused with scurvy, eczema, leprosy, syphilis, erysipelas, ankylostomiasis, &c.

The authors give an interesting summary of the historical records of the disease, beginning in 1735, when Casal described it in Oviedo in Spain. A curious feature in the history of pellagra is the fact that in countries where it has been known to prevail endemically for over a century, as in Spain, Italy, and France, there has been a peculiar tendency from time to time to consider the disease a thing of the past; an instructive instance being the oversight of pellagra in the United States of America until five or six years ago. It is now

* *Brit. Med. Journ.*, October 26, 1912.

known that the disease prevails in thirty-three States; 10,000 indubitable cases being on record. Recent importation and spontaneous origin are quite out of the question. Only centuries of prevalence can account for the wide range of pellagra in North America, extending from the Atlantic to the Pacific Ocean, and from the Gulf Coast to the Great Lakes; especially when one considers the peculiar topographic distribution of the disease, which in America, as in every other affected country, is limited to the foreland or "Piedmont country" of mountain ranges, and more particularly to the valley tracts of swift-flowing streams.

The authors have no hesitation in stating that the disease is endemic in the British Islands, and has long been so in various parts. Two certain and quite typical cases have already been described, one by Dr. James C. Howden in 1866, the other by Drs. R. Dods Brown and R. Cranston Low in 1909. There is also earlier though vague information which acquires strength in the light of these cases; and lastly, the result of the authors' own recent investigations in the eastern districts of Scotland, between the Firths of Forth and Pentland; including the knowledge of two other grave and typical cases as yet unrecorded, one studied by Dr. R. Cranston Low, the other under the care of Dr. Box, Sub-Dean of St. Thomas's Hospital, London.

Having obtained from Dr. Low the name of the village in which a recent unpublished case had occurred, the authors visited it twice, accompanied on one occasion by Dr. Low; the village is Colingsburgh, on the East Fifeshire coast. Notes of the case are given. The patient had lived all her life in the village. A relative of the patient presented some symptoms, which the authors regard as pellagrous. She had, however, been out of the United Kingdom. On visiting the farm where the pellagra patient was born, in a barn near which place many larvæ and some pupæ of *Simuliidæ* were to be discovered, the authors saw a woman and child presenting suspicious skin lesions on hands, arms, and face. In the fields close by they met a woman with erythematous eruption on the face, and a history of eruption on the dorsal surface of both hands and forearms, and this case they also regard with suspicion. In the Royal Montrose Asylum the authors were shown a Shetland Islander from Uist, who was admitted to the Edinburgh Asylum in 1880, and thence transferred to Montrose Asylum in 1881, where he has been ever since. Notes are given of his pellagra-like symptoms and condition. At the Aberdeen Royal Asylum the Superintendent informed the authors of a possible case from New Aberdour, who had recently died in the Asylum. Details of his pellagra-like condition are given.

On the Ugie, a typical *Simulium* stream, near Petershead, Aberdeenshire, the authors met several children presenting the peculiar skin lesions characteristic of pellagrin children after the subsidence of the eruptive stage.

Finally, on their return to London, Dr. Sandwith informed the authors of the presence of a suspicious case at St. Thomas's Hospital under the care of Dr. Box; thanks to the latter's courtesy they were able to see a most severe and typical case in a boy who had never been out of England. A note by Dr. Box gives details of this case; a complete report, together with the pathological findings, may be published in due course.

The authors believe that the information so far collected is sufficient to prove that for an undetermined but long time pellagra has prevailed endemically in parts of the United Kingdom, and that, notwithstanding the recognition and publication of two grave cases, the disease has been generally overlooked in its milder and more obscure forms.

The presence of pellagra in the British Islands is of geographic interest, because hitherto the disease was held to be limited northwards by the forty-fifth parallel. Etiologically its presence in the United Kingdom is of importance, because here its causation cannot reasonably be explained by the consumption of either sound or bad maize; and its topographic distribution shows that here, as elsewhere, it is linked to the swift-flowing *Simulium*-infected streams.

The authors are to be congratulated on their important paper; exception must, however, be taken to their statement at the end of the paper concerning the topographic distribution of the disease in the United Kingdom.

Doubtless they are perfectly correct, but the evidence as stated in this paper does not appear to warrant, in the reader's mind, more than a recognition of the possibility that "here . . . it is linked to the swift-flowing *Simulium*-infected streams."

Notes and News.

IMPERIAL INSTITUTE.—Synopsis of contents of the *Bulletin of the Imperial Institute* for vol. x (1912), No. 3.—The third quarterly issue of the *Bulletin of the Imperial Institute* contains reports of recent investigations by the scientific and technical staff; the first (on Uganda) of a series of special articles to be contributed by experts, describing the developments—chiefly agricultural—that are taking place in the Colonies, particularly in the Crown Colonies and Protectorates; and several special reports. A section of the *Bulletin*, dealing with *Recent Progress in Agriculture* and the development of Natural Resources, gives a summary of all important new developments in agriculture and planting during the previous quarter. A note on *Seaweed as a Manure* points to a new source of potash salts in the large seaweeds of the Pacific growing within the three-mile limit of the American coastlands, which could be made to yield annually about eight million tons of potassium chloride. Reports are published on Rubber from Ceylon, the Gold Coast, North-Western Rhodesia, Papua, and British New Guinea. Two new rubber-

yielding plants from Papua, about which very little is known, are described and analyzed.

The leading article is on *The Improvement of Cotton in India*, reports on which show what is being done to remedy the defect of short-staple cotton grown in India; and detailed descriptions are given of the results of examination in the Institute laboratories of improved cottons.

Correspondence.

CAN ANGLO-SAXONS COLONIZE THE TROPICS?

To the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

SIRS,—I should be very much obliged if any of your readers who are familiar with the Tropics would give me their opinion as to whether there is any hope of the successful and permanent settlement of British-born or descended people in regions between the Tropics of Cancer and Capricorn. At the present time, the subject of the colonization of the Northern Territory of Australia has come into the realities of practical politics, and there are many in the Commonwealth, including those in authority, who insist that only Anglo-Saxons, or failing them, Northern Europeans, such as Danes and Swedes, should be encouraged to go and settle there. I have very grave doubts whether a population which will have to work hard in the open throughout the year can be drawn from the Anglo-Saxon race, especially as the wives and children of the workers will have to remain continuously in the Tropics. I should be glad, however, to know from those who have had experience of such places as the West Indies, British Guiana, Mauritius, Ceylon, and India, where will probably be found persons of pure British or Northern European descent, whose forefathers have resided for several generations in the Tropics, what is the physical, mental, and moral condition of such people.

Have they retained all the virility and capacity for work of their ancestors, or do they show signs of deterioration? How do the women and children compare with those who have been born and bred in the British Isles? I am convinced that the Commonwealth Government is attempting a costly and disastrous experiment in seeking to transplant people from the temperate regions to the Tropics, and in rejecting the opportunity of obtaining a large number of desirable colonists from Malta, which is a sub-tropical country, and whose inhabitants therefore would be much better adapted for settlement on the hot river flats of Northern Australia than any blonde Northern European could possibly be.

Thanking my informants in anticipation,

Yours truly,

RICHARD ARTHUR, M.D.Edin.

Parliament House,
Sydney,
October 7, 1912.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"The Journal of the American Medical Association," vol. lix, No. 17, October 26, 1912.

Six-day Fever.—Deeks describes a hitherto unrecognized six-day fever in Ancon, Canal Zone. Darling and Clark have failed to obtain any germ from the blood in the cases, and the stools and urine have also given negative results. The affection seems to resemble the exanthemata, minus the rash. It has a definite onset and runs a definite course. Deeks believes it is probably identical with the seven-day fever described by Castellani in Ceylon, and by Rogers and Crombie in India. The epidemic is gradually spreading through the city of Panama, and it is supposed that the disease has only been recently imported.

"Scientific Memoirs by Officers of the Medical and Sanitary Departments of the Government of India." New Series. No. 51.

The Leprosy Streptothrix.—Liston and Williams describe a streptothrix isolated from the spleen of a leper. The case was of interest for two reasons—(1) because the streptothrix closely resembled that described by Deycke and Rost, and (2) because of the curious variations of the growth in respect to (*a*) morphology, (*b*) staining reactions, and (*c*) pigment production. A description of these peculiarities is given and also a very good coloured plate.

"Journal of the Royal Army Medical Corps," vol. xix, No. 5, November, 1912.

Typhus Fever.—Birt, writing on this subject, states the prevention of typhus fever is summed up in the destruction of pediculi. Forty years ago the prophylactic measures taught by experience ensured this. Murchison says: "When typhus is prevalent, no person, whether ill or not, ought to be admitted among the other inmates of a workhouse, without having a warm bath and other clothing, while his own clothes are being purified." And "when a typhus patient is brought to hospital, care should be taken to disinfect his clothes, before they are restored to him or to his friends. The underclothing ought to be immediately immersed in a solution of carbolic acid, Condy's fluid, or chloride of lime, and after twenty-four hours washed, boiled, and hung out in the open air. The outer clothing ought to be exposed for some hours to a day heat of 212° F., then subjected to the fumes of sulphurous acid or chlorine, and afterwards hung in the open air. The linen and bed clothes used by typhus patients should be treated in the same way. They ought to be kept apart from those used by other patients." "The bedding ought to be taken to pieces, thoroughly washed and baked, and then exposed to the air. The bedstead should be washed with carbolic solution, Condy's fluid, or chloride of lime." "The same beds and bedding ought always to be reserved for typhus cases." "Friends, who visit the sick, should be prevented from sitting on their beds, or approaching close. All unnecessary visits are to be prohibited. Personal cleanliness, frequent bathing, and frequent changes of underclothing ought to be enjoined on every person who is exposed to typhus." "Abundant evidence might be collected to demonstrate the efficacy of the measures here recommended." These statements, in view of the recent work connecting lice with typhus fever, are of the very greatest interest.

"Journal of the Royal Army Medical Corps," vol. xix, No. 5, November, 1912.

The Prevention of Malaria.—Herrick contributes a very interesting article on the prevention of malaria at Hyderabad, Sind. The months of greatest incidence of mosquitoes were from September to November, and the following species of anophelines were found: *Myzomyia, Culicifacies, M. rossii, Cellia pulcherrima*, and *Pyretophorus jeyporiensis*. Good results followed the preventative measures adopted.

"Annals of Tropical Medicine and Parasitology," Series T. M., vol. vi, No. 3 B, October 18, 1912.

Urriola's Test for Malaria.—Sinton repeated Urriola's test, but on account of the small number of cases examined he thinks it is impossible to make any definite statement of its value. It appears to him, however, that—

(1) It is almost impossible to exclude the possibility of the pigment derived from extraneous sources finding its way into the urine, and therefore the presence of small quantities of fairly large masses of pigment appears to be of no diagnostic value.

(2) The trouble necessary to exclude the possibility of extraneous pigment appears to be too great in comparison with the value of the test.

(3) As far as can be concluded from the few cases examined, the presence of pigmented leucocytes or casts appears to be of more value than free pigment in making a diagnosis of present or past malaria, especially in chronic cases.

(4) The presence of pigmented leucocytes or casts does not seem to be an indication of active malaria, but rather of the fact that the patient has at some time or other had malaria. Two of his cases were examined just before being discharged as cured, and one had had no signs of malaria for two years, yet they all showed pigmented leucocytes. The presence of such pigment in the urine probably represents an attempt by the body, both during an infection and after the infection has passed off, to get rid of the pigment deposited in the tissues.

"Annales d'Hygiène et de Médecine Coloniales," No. 3, July, August, September, 1912.

Filariasis.—Cazanove, writing on filariasis in black soldiers in Algiers, states that about one-third of these were infected with filariæ. He believes that such infections are equally prevalent in French Equatorial and West Africa. The presence of the filariæ in the blood did not appear to sensibly influence the capacity for service of those infected. The author believes that filariasis may be acquired in other ways than by the bites of infected mosquitoes.

"Annals of Tropical Medicine and Parasitology," Series T. M., vol. vi, No. 3 B, October 18, 1912.

Cultivation of Malarial Parasites.—Sinton repeated Bass's experiments for cultivating malarial parasites in vitro. In none of his cultures was he able to satisfy himself that any increase, either in number or size, occurred in the parasites, although they persisted in some of the culture tubes for a very long time. Attempts at subculture gave no satisfactory results, although the parasites could be found for a few days. No marked differences were detected in cultures kept aerobically or anaerobically.

"Lancet," October 26, 1912.

Emetine and Dysentery.—Walsh, in a letter to the Editor of the *Lancet*, states that he used emetine for dysentery with good results in September, 1891. (*Vide Indian Medical Gazette*, September, 1891.) No distinction was made between cases due to amœbæ and those due to bacilli. He indicates in his letter that Rogers' treatment is not therefore a new one.

"Archiv für Schiffs- und Tropen-Hygiene," September, 1912.

Phagedænic Ulcer.—In acute phagedænic ulcer Schüffner has not been able to confirm the good effects obtained by Werner in tropical phagedæna. Schüffner (*Arch. f. Schiffs u. Trop.-Hyg.*, iii. Bd. 16, 1912) has had excellent results in tropical phagedænic ulcer by removing the sloughs by cutting (not scraping) and packing the sore with gauze soaked in lead lotion or peroxide of hydrogen.

"British Medical Journal," October 12, 1912.

Life of the Rat-flea.—Nicoll contributes a paper on the length of life of the rat-flea apart from its host. From his experiments he has deduced the following conclusions:—

(1) Material infected with fleas and larvæ may remain infected for as long as a year.

(2) This appears to be due to the fact that the larval and pupal stages in the development are greatly prolonged under the adverse conditions. Dampness, however, rapidly kills off both fleas and larvæ.

(3) No direct evidence was obtained that the fleas bred under these conditions; but the appearance of larvæ towards the end of some of the experiments suggests that they did breed to some extent.

(4) Fleas derived from the infected material readily attacked rats, and proceeded to multiply in the course of a short time.

"Journal of the Royal Army Medical Corps," vol. xix, No. 4, October, 1912.

Malaria Coma mistaken for Drunkenness.—Colonel Smith, R.A.M.C., D.S.O., reports an instructive case of malaria being mistaken for drunkenness. A soldier was removed from a tramcar in Calcutta late one night on the supposition that he was drunk. He lay all night insensible in a guard-room, and was only removed to hospital next morning when it was found he had not recovered. When examined there he presented the features of concussion, but an investigation of the blood revealed the presence of malarial parasites, and so gave the clue to the proper diagnosis. Under suitable doses of quinine he quickly recovered.

Oryzanin in Beri-beri.

Rice and Beri-beri.—Under the name of "Oryzanin, the Japanese observers, Suzuki, Shimamura, and Odake, have succeeded in isolating from the millings of rice (rice bran) a chemical compound which is experimentally considered to be capable of averting the symptoms of Beri-beri or serving as a curative agent when the disease has developed. The active principle "Oryzanin" is met with in the alcoholic extract of rice polishings, and in its crude form has been shown to revive pigeons fed on polished rice until peripheral neuritis declared itself. The "Oryzanin" when added to the rice diet prevents the deleterious symptoms attending feeding on rice, and also restores pigeons after the peripheral neuritis is present.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

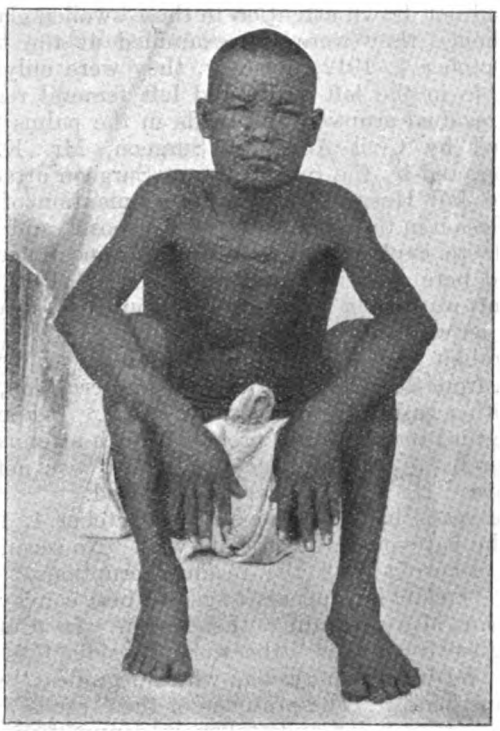
Original Communications.

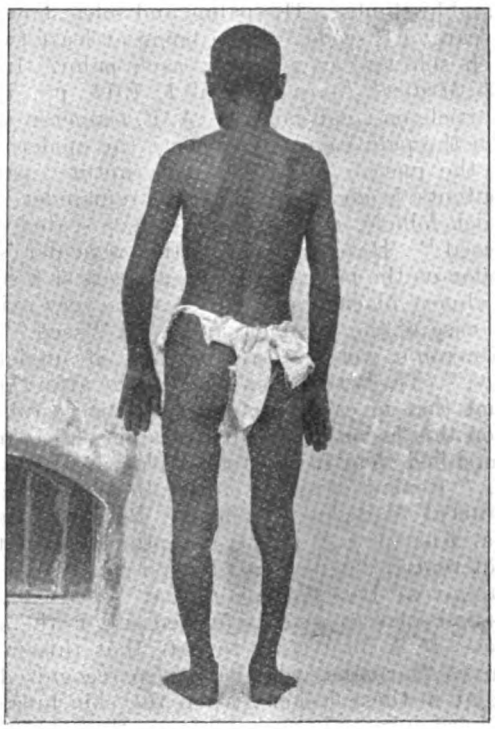
A RARE, AND PROBABLY UNDESCRIBED, ERUPTION IN SMALL-POX.

By Lawrence G. Fink, M.B., C.M.Edin.

Civil Surgeon and Superintendent, Central Jail, Myaungmya, Burma.

Maun Thet She, Burman, aged 22, was admitted to jail on May 4, 1912, in indifferent health, weight 128 lb. This man belongs to Makale Pegoung village (Wakema Sub-division), where, he states, there were seven cases of small-pox. On April 28, 1912, he was for an hour in the house of a person in the scaling stage of the disease. On April 29, 1912, he left his village and went to Moulmeingyun, where he was tried the following day by the local magistrate and convicted. He remained in the police lock-up there till May 3, 1912, and on that day was brought by steamer to Myaungmya, and was admitted to jail on May 5, 1912. On May 20, 1912, evening, he came to the Jail Hospital with a temperature of 104.6° F. He was kept under observation the next day, and on May 22, 1912, he was admitted and segregated, as eruptions had appeared on his face, forearms, and body. He stated that he had had fever, backache, and pains in his joints, from May 18, 1912, but he had not reported feeling ill. He had two fair-sized vaccination scars on his left arm, the result of vaccination fourteen years before, when he was 8 years old. He has not had small-pox before, and has never been inoculated. He has also not been revaccinated till four days after his admission to jail, but this was not successful. He was then in the incubation stage of small-pox. The prisoner stated that eruptions first appeared on the night of May 21, 1912, but these were not seen by us till the following morning, and the question of diagnosis, small-pox or chicken-pox, had to be decided. The incubation period of the former is usually given as twelve to fourteen days, and that of the latter seventeen days or more. On May 18, 1912, when the man is said to have first got fever, he had been fifteen days in jail, and during this period had not been in contact with any case of small-pox. He says he has not been in contact with such since April 28, 1912, *i.e.*, twenty-one days before he first got fever. As this appeared to be a very long incubation period for small-pox, the further development of the eruptions was carefully watched. The following are the principal points noted: The vesicles developed slowly as in small-pox, and scabs first began to form on the face on the tenth day. The majority of the vesicles were globular, but some were irregular in shape. They were closer set on the face than on the body; closer on the forearms than on the arms; closer on the legs than on the thighs; closer on the back than on the front of the body; closer on the upper than on the lower part of the back; they were more numerous on the extensor than on the flexor surface of the extremities; they were well-developed on the hands and feet and formed well-





marked "seeds" in the palms and soles. The majority of the vesicles showed no umbilication and appeared superficial. On pricking some collapsed and others did not. Secondary fever occurred when the stage of pustulation began.

The slow development of the eruptions, their appearance first on face and forearms, their density in the areas above mentioned, secondary fever, and the presence of "seeds" in the palms and soles, left no doubt as to the disease being small-pox. The incubation period was probably twenty-one days, but similar cases have been recorded by others. The photographs show the eruptions on the sixth day after their first appearance.

From May 22, 1912, to July 4, 1912, the prisoner was under treatment. On July 5, 1912, he was well, and was put on the convalescent gang. His face is decidedly pitted and to a lesser extent his body and his limbs. His palms and soles show very clear scars of "seeds," there being at least twenty on each sole and as many on each palm. In the *British Medical Journal*, April 1, 1911, pp. 741-7, in an article on small-pox, Dr. A. F. Cameron states that on the palms and soles where the epidermis is thick, the pustule often does not rupture; part of its contents is absorbed, and the remainder, with the thick follicle, constitutes the deep-seated crust or "seed." He also says in the vesicular stage the lesion on the palms and soles appears as a small, dark, almost black area. These were very evident in the case of the prisoner, and each "seed" had, in Cameron's words, "a sensation of unyielding solidity." The writer has also drawn attention to the fact that in cases protected by successful vaccination this lesion on the palms and soles is much less modified than it is in other places. In Part I of the "Review of some of the Recent Advances in Tropical Medicine, Wellcome Research Laboratories, Khartoum," p. 29, the principal points in the differential diagnosis of chicken-pox from small-pox are given. It is stated here that "seeds" in the palms and soles are usually formed only in the latter disease. It is interesting to note that this fact is known to Burmans, who have also recognized the fact that in these lesions, when the skin breaks, a small hard substance resembling, as they say, "the seeds of a chilli," comes out. This is the literal translation of the Burmese word used to describe the lesion. They further state that it never occurs in chicken-pox.

On August 7, 1912, the prisoner was discharged quite well from the convalescent gang and put on ordinary labour. He increased in weight and looked perfectly healthy. On September 21, 1912, two and a half months after he was convalescent, he had an attack of fever, but the temperature was not recorded. The following morning papules appeared and some of these developed into vesicles. A few of these vesicles became pustular and scabs formed. The lesions were in every respect similar to those of a mild case of chicken-pox or modified small-pox. The prisoner had not been in contact with any person suffering from either of these diseases. The eruptions were most numerous on the back and chest, and there were a few on the face and extremities. They were all very superficial, and the scabs were thin. On examining the hands two "seeds" were found on the palmar aspect of the left hand and one resembling the "dark, black area" described by Cameron, and really a vesicular "seed," on the right middle finger. On questioning an aged Burman prisoner, who has a reputation as a Saya (medicine man), about this strange phenomenon, he informed me that very rarely a residual eruption occurs after an attack of small-pox, that the skin lesions are mild, and that at the same time there is usually a swelling of the glands in the axillæ or neck. This information I elicited in the hospital on the morning of October 1, 1912, and in examining the patient a few minutes later on in the segregation cell I was informed by him that shortly after the eruptions appeared, the glands in the axillæ and in the femoral region were swollen to the size of a pigeon's egg. He had not drawn attention to these swollen glands, and hence they were not examined at the time. On October 1, 1912, however, they were only just palpable in the left axilla and left femoral region. This residual eruption and seeds in the palms were verified by Civil Assistant Surgeon, Mr. K. R. Menon, and by the Sub-Assistant Surgeon attached to the Jail Hospital. There is no mention of any such lesion in the literature at my disposal, and I am unable to explain the cause of its appearance. I should here mention that on August 1, 1912, the patient was again re-vaccinated, but not successfully, as was anticipated.

A rabbit and a calf were inoculated with lymph taken from the vesicles of the residual eruption, but in neither case with any positive result. It appears to me that the virus was probably much attenuated, and probably in this stage the patient was not infectious. He was, however, segregated.

The scabs had all fallen off by October 4, 1912, and the patient was practically well. No secondary fever occurred with the residual eruptions. The word "residual" appears to me to best convey the Burman idea regarding the lesion. In Crabb's "English Synonyms" the word "residue" is said to be derived from *resido*, which signifies "what remains back." The presence of the "seeds" was a noteworthy point and, taken in conjunction with the eruption elsewhere, leaves no doubt in my mind as to the nature of the lesion. I shall be pleased to hear of any observations that may have been made by others on this interesting and apparently very rare phenomenon.

NOTE ON CERTAIN CELL INCLUSIONS.

By Aldo Castellani, M.D.

Director, Government Clinic for Tropical Diseases, Colombo (Ceylon).

In films taken from various pathological lesions and stained by Giemsa's or Leishman's modifications of Romanowsky's method, I have often observed various kinds of cell inclusions which, for convenience sake, may be described under two headings:—

(1) Those of type A or chlamydozoa-like.

(2) Those of type B.

Cell Inclusions of Type A. Case of Chronic Urethritis of Non-gonorrhœic Origin.—Mr. D., European, aged 40, residing in Ceylon for many years, consulted me in January, 1911, for a form of urethritis. He had been married ten years; denied ever having had gonorrhœa before his marriage; in fact, denied having had sexual intercourse before his marriage, and later, having had any extra-conjugal intercourse. The discharge, which had been first noticed a month previous to his consulting me, was very scanty, thin, whitish, present only in the morning or after violent exertion, or after taking more than the usual amount of alcohol. Microscopically the discharge was composed almost completely of epithelial cells, leucocytes being very rare. I could never detect any gonococci, either microscopically or culturally. Occasionally *Staphylococcus pyogenes albus* was grown, but I do not think this coccus could be the cause of the discharge, as—in people living in the

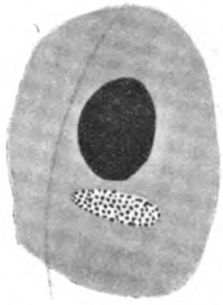


FIG. 1.—Inclusions of type A (chlamydozoa-like bodies) in the epithelial cells of the urethra.

Tropics—it is found occasionally in the portion of the urethra near the meatus; moreover, it was an absolutely avirulent strain, and injections of permanganate of potassium made it disappear quickly, but the discharge persisted. Examining the epithelial cells present in the discharge I noticed peculiar bodies closely resembling Prowazek's chlamydozoa. They appeared like masses of small granules grouped together closely in such a way as to form an oval mass or body, the maximum diameter of which varied between 2 and 6 microns. The individual granules were roundish, ½ to 1 micron in diameter, and most of them took in preparations stained by Giemsa's or Leishman's stain a purplish-red colour; some stained a peculiar bluish-purplish colour; in several preparations there was evidence of a pale bluish staining substance, suggesting a matrix holding the granules together. The discharge was most obstinate, and numerous treatments were tried; urethral injections of various antiseptics, balsams by the mouth, gonococcus and staphylococcus vaccines, without any effect. The patient, after six months, became discouraged and gave up further treatment. About a year after the discharge was first noticed the condition began to get gradually better, and at the present time (March, 1912) there is no discharge whatever from the urethra, even after the patient has taken violent exercise. As regards the nature of the bodies found I am not in a position to come to any definite conclusion; they certainly had every appearance of chlamydozoa. It must be noted that the finding of chlamydozoa-like bodies in some forms of urethritis is no new observation; some authorities have found them together with the gonococci.

Chlamydozoa-like Bodies in Epithelial Cells of the Conjunctiva.—Prowazek was the first to describe chlamydozoa bodies in the conjunctiva of cases suffering from trachoma. Later on he described somewhat similar bodies in a peculiar disease of

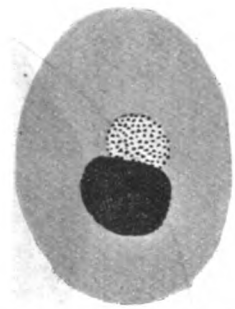


FIG. 2.—Inclusions of type A (chlamydozoa-like bodies) in the epithelial cells of the conjunctiva.

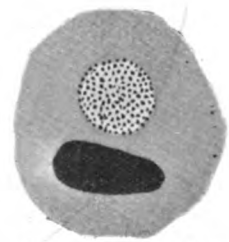


FIG. 3.—Inclusions of type A (chlamydozoa-like bodies) in the epithelial cells of the conjunctiva.

the eyes which he observed in Samoa, and which he called "Epitheliosis desquamativa conjunctivæ der Südsee." In the first stage this disease is characterized by a very severe epithelial desquamation of the conjunctival mucosa, later on there is a purulent stage, and finally atrophic changes develop. Chlamydozoa-like bodies have been described also in cases clinically indistinguishable from gonorrhœal ophthalmia but where gonococci could not be found.

In Colombo, in January last, a Cingalese woman was admitted to the clinic with severe malarial fever. On admission the woman did not complain of pain in her eyes, but I remarked that the conjunctiva of both eyes was slightly inflamed. The day after, in the morning the temperature was

normal; in the afternoon she began to complain of severe pain in her eyes, and photophobia and a thin discharge appeared, which on microscopical examination consisted almost solely of epithelial cells, leucocytes being extremely rare; no gonococci or other germs present. The next day the pain was very severe, marked photophobia; the palpebral conjunctiva was of a peculiar livid colour, and a more abundant but still rather thin, whitish discharge was present. The microscopical examination showed the presence of an enormous number of epithelial cells, but very few leucocytes, and no cocci or bacilli of any kind; I may say that culturally, on one occasion, a common sarcina was grown, but this germ could hardly have any connection with the disease. Films from the discharge were made and stained with Giemsa; in several epithelial cells chlamydozoa-like bodies were detected; roundish or oval agglomerations of granules could be seen, the granules being roundish, very small, stained some purplish-red, others blue, collected in oval masses. These ovoid or elliptical masses of granules were not limited by anything comparable to any membrane-like structure. The individual granules were very small, about ½ a micron, spherical. In preparations stained by Gram the granules did not stain. As regards the progress of the disease instillations every four hours of zinc sulph. (½ gr. to the ounce) alternately with mercury perchloride (1 in 5,000) quickly cured the patient; all the symptoms disappeared within two weeks.

Cell Inclusions of Type A. in the Epithelial Cells of the Oral Mucosa.—Miss ——, European, aged about 35, a resident in Ceylon for a number of years, developed typical sprue after a trip to Australia; the tongue showed no ulcers, but peculiar smooth patches denuded of epithelium as seen, in my experience, in many cases of typical sprue. Profound anæmia; liver by percussion much reduced in size. Attacks of diarrhœa with white frothy stools. Scrapings were made from the patches on the tongue, films prepared and stained by Giemsa's method. In a few epithelial cells peculiar ovoid or roundish agglomerations of granules could be seen; the granules were roundish, ⅔ to 1½ microns, stained deep red or purplish red; they were situated close together forming oval masses, some of which presented a portion at one extremity with very few or no granules, and staining occasionally bluish. These peculiar granule agglomerations could be seen only by careful focusing, and appeared to be intracellular; they were not the ordinary stain granules so often found in preparations stained with Giemsa

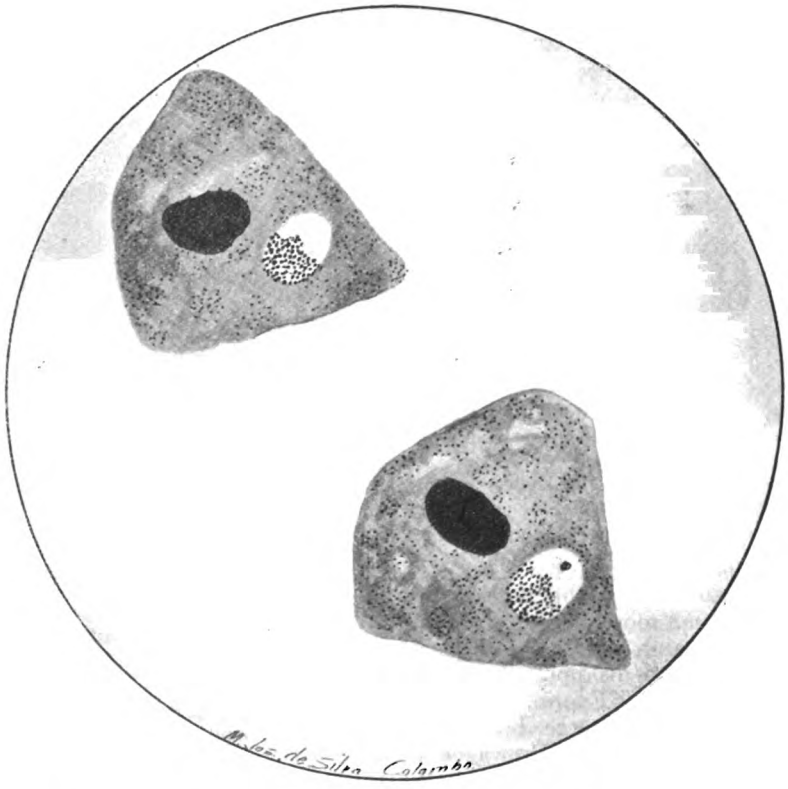
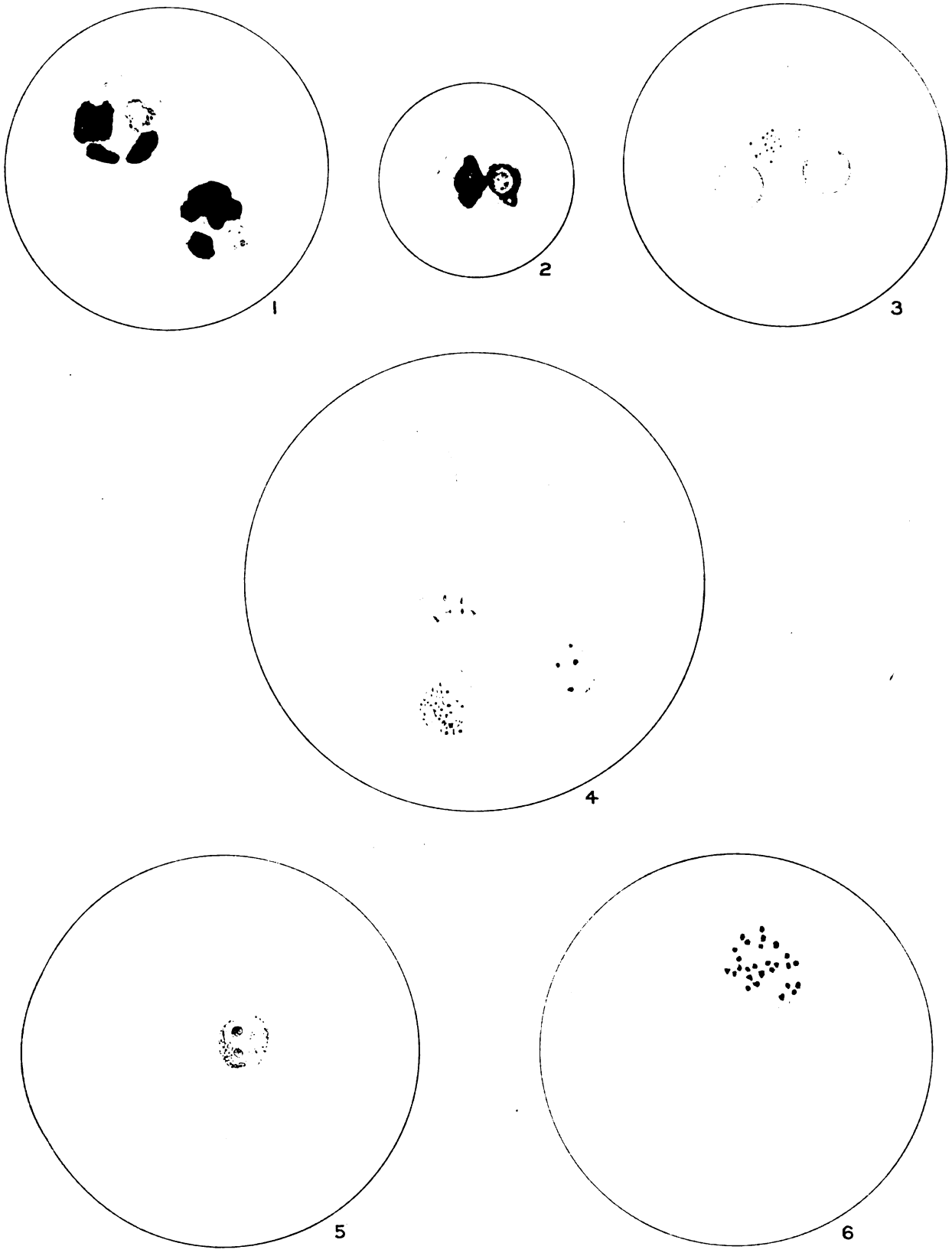


FIG. 4.—Inclusions of type A in the epithelial cells of the oral mucosa.



1, 2. Cell inclusions of type B in a case of Psoriasis.
3. Basophile cell with chromatin dots in a case of Yaws.
4. Basophile cells (two vacuolated) with chromatin dots in a case of Yaws.
5. Basophile cell with two chromatin masses and numerous chromatin dots in a case of Lichen Planus.
6. Basophile cell with chromatin dots in a case of severe anæmia of obscure origin.

NOTE ON CERTAIN CELL INCLUSIONS. By ALDO CASTELLANI, M.D.

when the staining has not been completely successful; they had not the usual appearance of the chromatoid granules often seen even in normal epithelial cells, which, in my experience, are distributed more diffusely all over the cell, and are not collected together in regular formations.

What is the nature of these bodies?

That sprue might be a chlamydozoon disease, or due to a parasite which in a stage of its development might become intracellular is not, of course, to be excluded. The fact that sprue is a form of epitheliosis desquamativa, the principal histopathological lesion of the malady being a severe process of desquamation of the mucosæ of the organs of the digestive system, would be rather in favour of the hypothesis, as chlamydozoa have been found principally in diseases where epithelial desquamation is a marked feature, as, for instance, the desquamative ophthalmia of Samoa. Considering, however, that the cell inclusions above described are far from being constant, I believe they are of non-parasitic nature, probably products of degeneration induced by some special transitory unknown circumstances. It is also to be noted that even the typical chlamydozoa, as found by Prowazek in trachoma, &c., are by several authors, even very recent ones, considered to be non-parasitic inclusions, but merely products of cell degeneration.

Cell Inclusions of Type B.—The cell inclusions I propose to describe under the term *Type B* (see coloured plate 1, 2) are quite different from the inclusions described under the term *Type A* or chlamydozoa-like. I called attention to them in 1905 in some of my papers on yaws. They are of fairly common occurrence and it is certain they must have been seen by many other observers, but in the literature I have been able to consult I have not come across any descriptions which might with certainty be referred to these bodies. These inclusions of type B may be found in epithelial cells as well as leucocytes; they may be in (1) the cytoplasm of the cells, or (2) they may be intranuclear. These inclusions take with Giemsa's stain a blue colour, sometimes of a pale tinge, sometimes of a deep hue. They are roundish, or oval, or pear-shaped. The maximum diameter varies from 2 to 5 or 6 microns; they are occasionally vacuolated and almost constantly present some dots of chromatin. By focusing it is easy to convince oneself that they are really inside the protoplasm and the nucleus and that they are not lying externally on the leucocytes and epithelial cells. What is the nature of these inclusions? They are not, in my opinion, parasitic, as they are found identical in shape and staining reactions in diseases of most different etiological nature, such as yaws, psoriasis, acne vulgaris, lichen ruber, &c. They cannot be confused with Ferrata plasmosomes or Kurloff's bodies,* the former being metachromatic and the latter staining purplish or reddish. They are certainly different from the bodies recently described by Sir William Leishman in blackwater fever and the ones noticed by Low in other diseases. The true nature of these intracellular inclusions is revealed, I think, by the presence in several films of some peculiar *free* bodies. These bodies are oval or roundish, 3 to 7 microns in diameter; they stain diffusely blue, generally pale blue, and present numerous granules which take up deeply the chromatin stain and appear purplish-red. These chromatin dots are generally present in rather large numbers; they are, as a rule, roundish, of fairly equal size, but occasionally two or three granules may be of much larger size than the others visible in the same body. These oval and roundish delicate, free bodies, staining with Romanowsky diffusely blue, and presenting multiple chromatin granules were first seen by me in cases of yaws. They are easily differentiated from red platelets, lacking the peculiar reticular structure of these. I was at first inclined to think that they might have something to do with the development of *S. pertenuis;* and a very well-known protozoologist, to whom films were sent for inspection, was of the same opinion. Later on I found them in films from psoriasis lesions, lichen and acne lesions, severe anæmia, and in other conditions, and came to the conclusion that these bodies are merely red cells undergoing degenerative changes, characterized by their losing their outline, becoming fragile, basophile, and by the appearance of granules which take up deeply the chromatin stain. I have come to this conclusion having been able to see every intermediate stage from the normal erythrocytes to these chromatin dotted blue bodies: the erythrocyte staining bluish in the centre; the erythrocyte often oval-shaped or roundish, but smaller than normal, which has become basophile, staining blue diffusely; the basophile oval erythrocyte or the basophile roundish micro-erythrocyte staining blue, but presenting numerous chromatin dots; the vacuolated blue staining erythrocyte with numerous chromatin dots; the blue, chromatin-dotted basophile erythrocyte undergoing fragmentation; these fragments being of small size, 2 to 4 microns, oval in shape or roundish, staining blue, with a few chromatin dots, are indeed very misleading and have practically every appearance of a stained protozoal parasite. These fragments are engulfed by phagocytic cells and appear in these as inclusions of type B.

That the free, chromatin dotted blue bodies are degenerated erythrocytes there can be little doubt, but it may be interesting to study a little further the presence in them of the peculiar chromatin granules. As is well known, the granules found in human erythrocytes in films stained by Giemsa's or Leishman's methods may be classified as follows:—

(1) Maurer's bodies, found in erythrocytes infected with subtertian malaria parasites.

(2) Plehn's bodies, staining blue, of smaller size than Maurer's bodies, common in some cases of malaria in uninfected corpuscles.

(3) "Schüffner's dots," granules staining red, or

* These bodies have been thoroughly investigated by Ledingham, Schilling, Ross and Patella. Ledingham and Ross consider them to be parasitic.

pinkish-red in erythrocytes infected with the benign tertian parasite. These dots, as noted by Mathis and Leger, are well shown by Leishman's stain, while they may be completely absent in preparations stained by Giemsa's.

(4) Metachromatic and polychromatic granules; they do not take a true chromatin stain.

(5) Jolly-Howell's granules. These consist of one or two spherical granules found generally in normally staining and normal-shaped red cells; they take up a true chromatin stain. To these varieties of granules may be added—in the lower animals—the "parasitic granules," such as *Anaplasma marginale* of Theiler, and also Balfour's granules in fowl spirochætosis.

The chromatin granules of the blue-staining bodies which I consider degenerated basophile erythrocytes have certainly some resemblance to parasitic granules, and if they had been observed in yaws only—the etiological agent of this disease being a spirochæte—one might have thought of their being of the nature of the endoglobular parasitic granules found by Balfour and Sambon in fowl spirochætosis: the fact, however, that I have seen them also in non-protozoal diseases, such as acne vulgaris, disposes, I think, of the parasitic theory. The granules I have observed cannot evidently be compared to any of the varieties of granules mentioned above, Maurer's bodies, &c., except, it seems to me, the Jolly's granules; these, however, are single or double, and generally found in normal-looking erythrocytes; the granules I am referring to are multiple, and are always found in degenerated basophile erythrocytes. I consider them to be products of cellular degeneration, but not nuclear remnants as the Jolly bodies are generally believed to be.

Résumé and Conclusions.—(1) Inclusions of "type A or chlamydozoa-like" have been observed by me in epithelial cells of the urethra, of the conjunctiva, and of the oral mucosa. I consider them, with the possible exception of those found in the conjunctival mucosa, as merely products of cellular degeneration.

(2) Cell inclusions of "type B," to which I called attention in 1905, oval or roundish bodies, staining by Giemsa or Leishman pale or deep blue, occasionally vacuolated and generally presenting some chromatin dots, are found in yaws, psoriasis, and many other pathological conditions in the leucocytes and epithelial cells. I do not consider them to be of parasitic nature.

(3) Oval or roundish free bodies, varying greatly in size, are often seen in films from yaws, psoriasis, and other pathological conditions, staining blue and presenting numerous granules which take the chromatin stain deeply. These bodies are degenerated basophile erythrocytes presenting chromatin dots. These blue, chromatin dotted bodies, or fragments of these bodies, are engulfed by the leucocytes and other phagocytic cells, and most probably appear in these cells as inclusions of type B.

(4) The true nature of the chromatin dots in the free blue staining bodies (degenerated basophile red cells) is unknown, but I adhere to the opinion that they are not parasitic. They are quite different from the more usual granules found in red blood cells. They take the chromatin stain deeply, and closely resemble, in my opinion, the Jolly's granules, though in contrast to these they are present in large numbers, and are always found in basophile cells.

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EXPERIMENTS WITH CRUDE CARBOLIC ACID AS A LARVICIDE IN BRITISH GUIANA.

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The question of the choice of a larvicide in this Colony is somewhat difficult. Paraffine either in its pure or crude state, and even heavy petroleum oil, is useless, except in a few isolated cases. Most of the ponds and small temporary areas of water must be treated with a soluble form of larvicide, as owing to the strong wind always blowing, and the absolutely flat open nature of the ground, anything floating on the surface, such as oil, is quickly blown away to one side and evaporated before its asphyxiating properties come into play.

In the case of large areas of water such as drainage trenches, the breeding of larvæ is kept within bounds by keeping them well stocked with the small fishes known locally as "Cockerbellies," and clearing away all floating vegetation as far as possible. But these fish are in many cases unable to gain access to the many small depressions in the land holding temporary water, places such as recently dug pits for earth to burn, footprints of cows, &c.; it is in these cases that we have now adopted crude carbolic acid as combining the most important features of cheapness and efficiency.

It was employed with complete success during the camping-out of the local forces. A few days before the camp was pitched the ground was thoroughly surveyed, especially to windward of the

camp site. All puddles were as far as possible connected by narrow drains into deepish pits, and treated with crude carbolic acid, isolated areas were treated separately, and the large trenches to windward especially cleared from vegetation and well stocked with fish.

In most of the small pits, when treated with carbolic acid the larvæ were seen to die in about an hour, but in the case of pupæ the time was much longer, frequently as much as twenty-four hours, but when examined carefully the following day after treatment no larvæ or pupæ were seen alive.

We are inclined to the belief that, in the case of a temporary small collection of water if crude carbolic acid is applied it does not evaporate to any large extent, but concentrates as the puddle dries up, and further, that having dried up, the ground is sufficiently impregnated with the carbolic acid to render water deposited later by a shower of rain fatal to larvæ. Sufficient data have, however, not yet been collected to make an authoritative statement on this point. As will be seen by the laboratory experiments herewith a dilution of 1 in 20,000 is efficient as regards all larvæ inside two hours, but in the case of pupæ a much longer time is required, probably owing to the fact that pupæ possess a thick chitinous shell, and have no alimentary canal into which to take the poison.

For use we calculate one teaspoonful to every two cubic feet of water, or one ounce to sixteen cubic feet; this gives a dilution of about 1 in 16,000, and allows a fair margin of safety to cover errors in calculation.

The crude carbolic acid, containing all its impurities such as cresol, rosolic acid, and oily and tarry substances, is much more efficient than the purified, more highly soluble product, possibly owing to its sticky nature making it more adherent to the larvæ and pupæ, and also no doubt in a few cases to its blocking up the syphon tubes.

Experiment No. 2 bears out this point; in this series of experiments the crude carbolic was first freed from its oily and tarry substances by filtration before use. As will be seen in this form the toxic effects are developed more quickly. It is not efficient in such high dilutions as in a dilution of 1 in 20,000; half the larvæ and all the pupæ were alive at the expiration of three hours, whereas in the case of crude carbolic it was fatal to all the larvæ in one and a quarter hours.

With regard to the effects on animals the dilution used would not be fatal, as 12½ gallons would only contain 1 drm. (60 minims) of carbolic acid, not a very serious thing for even an animal capable of drinking 12½ gallons at one drink.

The water treated in this manner has a distinctly tarry odour, and animals do not drink it at all readily on this account, and further, the water treated in this way acquires a blackish colour.

We have not, however, found crude carbolic acid useful for spraying large areas with a Mackenzie spray, owing to the fact that some of its constituents are not soluble in water, but by constantly stirring the mixture in a bucket during the process a fairly satisfactory distribution can be obtained, but this requires supervision. When a large area of ground containing a number of small holes, such as footprints, has to be treated, it has been found more satisfactory to use preparations more freely miscible with water such as cyllin, chloro-naphtholeum or Sanitas okol, although the expense is much greater.

CRUDE CARBOLIC ACID AS A LARVICIDE.

Experiment No. 1.

(*Crude Carbolic Acid.*)

No.	Dilution	Condition of larvæ	Exposure time	Condition of pupæ	Exposure time
1	1 in 250	All dead	½ hour	All dead	½ hour
2	1 ,, 500	,,	,,	,,	,,
3	1 ,, 750	,,	,,	,,	,,
4	1 ,, 1,000	,,	,,	,,	,,
5	1 ,, 1,500	,,	,,	,,	,,
6	1 ,, 2,000	,,	1 hour	,,	10 hours
7	1 ,, 4,000	,,	,,	,,	12 hours
8	1 ,, 6,000	,,	,,	,,	,,
9	1 ,, 8,000	,,	,,	,,	,,
10	1 ,, 10,000	,,	,,	,,	,,
11	1 ,, 12,000	,,	,,	,,	17 hours
12	1 ,, 14,000	,,	,,	,,	,,
13	1 ,, 16,000	,,	1½ hours	,,	,,
14	1 ,, 20,000	,,	,,	,,	,,
15	1 ,, 25,000	,,	24 hours	1 alive only	24 hours
16	1 ,, 30,000	6 alive	,,	2 alive	,,
17	1 ,, 40,000	All alive	,,	All alive	,,
18	1 ,, 50,000	,,	,,	,,	,,
19	1 ,, 60,000	,,	,,	,,	,,

Experiment No. 2.

(*Filtered Carbolic Acid.*)

1	1 ,, 25,000	All alive	24 hours	All alive	24 hours
2	1 ,, 30,000	,,	,,	,,	,,
3	1 ,, 40,000	,,	,,	,,	,,
4	1 ,, 50,000	,,	,,	,,	,,
5	1 ,, 60,000	,,	,,	,,	,,

Experiment No. 3.

(*Pure Medicinal Carbolic Acid.*)

1	1 ,, 15,000	Part killed	½ hour	All alive	1 hour
2	1 ,, 20,000	Half alive	3 hours	,,	3 hours

VARIETIES OF LARVÆ AND PUPÆ USED.

Culicines.—*Culex fatigans*, *Stegomyia fasciata*, Culicidæ, Tæniorhynchus.

Anophelines.—*Cellia albipes*, *C. argyrotarsus*.

NUMBERS USED CONSTANTLY IN EACH EXPERIMENT.

Larvæ, 100; Pupæ, 20.

"Bulletin de la Société Medico-Chirurgicale de l'Indochine," tome iii, October, 1912, No. 8.

Distomiasis.—Roux and Tardieu report a case of hepatic distomiasis in a European due to the *Clonorchis sinensis*. This infection, though common in natives, is rare in Europeans. The treatment adopted was firstly cholagogues —calomel, urotropine, salicylate of soda—and then purgatives to expel any of the worms that might have passed into the intestine. The authors believe that this medication produced an appreciable amelioration of the symptoms.

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THE JOURNAL OF

Tropical Medicine and Hygiene

DECEMBER 2, 1912.

THE WHITE AUSTRALIAN PROBLEM.

IN the JOURNAL OF TROPICAL MEDICINE AND HYGIENE for November 15, 1912, page 351, Dr. Richard Arthur, of Sydney, asks in a letter addressed to the Editors, "Can Anglo-Saxons colonize the Tropics?" This is a question that has been often asked, and it is one which will be awaiting an answer whilst there remains a white-skinned person on the earth. A present-day doctrine is that disease, not climate, prevents the white man's progeny continuing in the Tropics; arrest disease and the white man can live and thrive in the Tropics, and his children can grow and continue to the third and fourth generation without evidence of physical or mental deterioration. This is a comforting and a comfortable doctrine, but in the opinion of many it admits only of a negative reply. There is no proof that the white man has continued to thrive in the Tropics to the extent of several generations, for as yet disease is so prevalent that the theory has not had a chance of being satisfactorily tested. The question, therefore, stands unanswered and unanswerable at present, for until the more deadly diseases of the Tropics are removed, we cannot even begin to study the question, and it can be only after three or four "disease-free" generations have been reared that an answer is possible. It will not, therefore, be in our time that a reply can be formulated; we can only do our best to avert disease, so that those coming after us may be able to study the question scientifically. With that statement we might rest content and wait, but the matter presses in certain parts of the British Dominions, and in no place more prominently than in Australia. Dr. Arthur writes from Sydney and requests that those in a position to judge, whether there is any hope of a successful and permanent settlement of British-born or descended people in regions to the north or tropical area of Australia, should declare their beliefs. As stated above, we have no evidence that such is possible, for no white people and their families have so far established themselves in continuous residence in tropical areas for any length of time. Dr. Arthur is convinced that the Australian Commonwealth is attempting a costly and disastrous experiment in seeking to transplant people from the temperate regions to the Australian Tropics. The writer agrees with Dr. Arthur in his dread as to the experiment being likely to lead to disaster, although there is no absolute proof that it must be so.

Most people, however, consider that climate independent of disease has a deteriorating influence, and there is much to support their belief. Everyone entering upon a study of the problem should read carefully Dr. Matthew O'Connell's articles on the meteorology of malaria which have appeared from time to time in this Journal. Exposure to the cotton shed atmosphere in Lancashire mills shows the effect of a continuously moist and hot air in producing a febrile state, and Dr. O'Connell contrasts this with the effects of exposure to a similar climate in the Tropics. In every country with even a temperate climate, where the air is warm and moist, the district is regarded as relaxing, and consequently deteriorating through the anæmia which such an atmosphere entails, and, when this atmospheric condition is the rule throughout all seasons of the year, a corresponding result must be anticipated.

We have had several strong advocates for a white Australia writing and speaking on this subject. Some have been medical men who have pronouncedly declared their belief that the white man can work and his progeny continue and thrive in northern portions of Australia. At the Society of Tropical Medicine and Hygiene in London there have been papers read on the subject, but the majority of listeners who have had experience in the Tropics were not convinced that these strenuous advocates were correct in their views. In fact, most of the audiences did not think it worth while to discuss a state of affairs which they pronounced a "hopeless" subject.

Let us see what white settlers in the Tropics at present do in the way of work. No white man tills the soil in these regions. He acts as superintendent on a tea, rubber, coffee, or sugar plantation;

as a clerk in a bank or merchant's office; as a broker, as a civil servant, as a clergyman, lawyer, or doctor, but he does not labour in the fields, and never has done so. Yet in Northern (Tropical) Australia advocates of a "white" Australia suggest that he can do so, and that he can rear children who can, in their turn, continue to labour on sugar plantations, &c. In no sugar plantation in America does a white man do so, and to those who know what the labour is, it is not possible he ever could do so.

There is no doubt that the climates of tropical and sub-tropical countries north and south of the Equator are different. To the north the great bulk of land engenders a "continental" climate characterized by extremes of heat and cold, whilst to the south the land is much smaller in bulk and the countries cooled to a greater extent by the proximity of the sea. Allowing, however, for this difference there are districts to the south where the heat defies the white man, and the northern portion of Australia is one of them. All Anglo-Saxons when settling in a new country congregate in that part where the climate most nearly resembles their own. In Canada the large towns are to the south of that vast territory, thereby avoiding the extreme cold of the more northerly parts; in the United States the large cities are as far north as possible, so as to avoid the heat of the Southern States; in the Cape the large centres are to be found in the coolest parts, and in Australia on the southern littoral the great towns are all gathered. The north is avoided by the white man for some evident reason; it cannot be because the south presents better facilities for commercial communication, for close to the northern shore are the islands of the great archipelago teeming with large populations, with all of which it would pay to open up commercial relations. The reason of its lying fallow is a climatic, not a pathological one. Disease cannot be said to exist, for there is practically no population on which its effects can be shown. The district is shunned for obvious reasons; the white man cannot labour and settle there in the hope of continuing the species, and the Commonwealth must make up its mind to one of two things, either that coloured labour must be admitted to develop the country or the country must lie fallow and continue to be neglected. There is danger in following the latter alternative, for the overflowing population of China and Japan must have an outlet, and the unoccupied areas of Australia offer a tempting site. One day the temptation may become overpowering, and if the Chinese or Japanese are not allowed to enter under the superintendence and pay of the white man they will be tempted to do so by force. If prevented by force of arms still will the northern district remain undeveloped, for no white labourer can thrive in the region now, nor at any time to come. The white population of Australia is not advancing satisfactorily in the more favoured districts of the island continent, and to sacrifice precious lives in the attempt to settle in yet more impossible regions is a policy of mere racial suicide.

J. CANTLIE.

Annotations.

Relapsing Fever in India.—Major Browse, I.M.S., in the *Indian Medical Gazette*, October, 1912, calls attention to a disease observed in Quetta, which appears to differ in many respects from the classical forms of recurrent fever at present described, and which at the same time has certain characteristics common to each. Though due to a spirochæte possessing no optical differences from the classical forms it differs from classical recurrent fever in the type of pyrexia, and the blood-changes, namely, the slightly marked polymorphonuclear increase and distinct large mononuclear increase. From African tick fever it differs chiefly in the very great contrast in climatic conditions under which it develops. The symptoms of this variety of relapsing fever are mild with a distinctive type of pyrexia with many paroxysms of short duration. The climatic condition under which it develops may have something to do with the changes in its symptomatology.

Intestinal Parasites in the Southern States of North America.—Wood, of Rochester, Minn., reports on the prevalence of intestinal parasites in the Southern States (*Journal of the American Medical Association*, vol. lix, No. 19, November 9, 1912). The subjoined tables give his results at a glance.

TABLE I.—SUMMARY OF THE INTESTINAL PARASITES REPORTED.

Total examinations reported	62,786
Total showing hookworm infestation ...	11,147
Percentage of hookworm infestation ...	17.7
Percentage of infestation by other parasites	6.5

	Number found	Ratio to other parasites Per cent.
Necator americanus	11,147	73.13
Ascaris lumbricoides	2,339	15.34
Hymenolepis nana	1,004	6.59
Trichocephalus dispar	551	3.62
Strongylus intestinalis	119	.79
Oxyuris vermicularis	72	.47
Tænia saginata	10	.06

TABLE II.—RATIO OF PARASITES FOUND.

	Arkansas	Florida	Georgia	Kentucky	Mississippi	North Carolina	Tennessee	Virginia
Necator americanus	94.5	41.6	94.7	40.9	90.9	82.9	47.1	65.7
Ascaris lumbricoides	2.7	7.3	1.9	42.8	1.3	17.9	34.4	26.3
Hymenolepis nana ...	1.1	39.6	2.8	.9	3.7	5.6	5.0	3.1
Trichocephalus dispar	.3	10.6	.1	15 4	—	3.1	8.6	3.2
Strongylus intestinalis	.7	.8	—	—	15.0	1.1	.2	—
Oxyuris vermicularis	.3	1.0	.2	—	.4	—	2.6	.9
Tænia saginata ...	—	—	—	—	.4	.03	1.1	—

These figures show that helminthic infections, especially with *Necator americanus*, are common. Trematodes are, however, rare in the Southern States, none being recognized in the examinations detailed above.

Leprosy.—In the *New York Medical Journal*, November 16, 1912, Wellman writes on the treatment of leprosy by salvarsan. He concludes from his study that the administration of salvarsan resulted in clinical improvement in four of five patients treated. The other case ended fatally from the result of accidental burns before observations could be completed. The two cases in which the disease was least advanced showed the best results. One of the controls remained unchanged in condition, and the other grew steadily worse, and finally died.

In one case, *Bacillus lepræ* disappeared from the nasal secretion after treatment, while other cases showed partial or complete resolution of the specimen nodules examined after treatment.

In view of these experiments Wellman believes that the following opinions can be formed:—

(1) In cases where the patient is not too much weakened from the disease, salvarsan may be administered without harm.

(2) Some improvement may be expected, especially in early cases.

(3) There is no evidence that such effect of the drug is in any way specific or permanent.

(4) Arsenic has long been employed in leprosy, and there is no evidence that salvarsan is superior in its action to the other forms of arsenic which have been used by previous observers.

Abstract.

The Filterable Viruses, a Summary.*

By S. B. Wolbach, M.D.

Assistant Professor of Bacteriology, Harvard University Medical School.

The author states that our knowledge of the existence of filterable viruses dates from 1898, and the diseases now known to be caused by them are thirty in number.

By filterable viruses is meant micro-organisms which will pass through filters, the pores of which are too small to give passage to bacteria. Such filters are the well-known Berkefeld filter, made of diatomaceous earth, and the Chamberland filter, made of unglazed porcelain. Both types of filters have been used for many years for the purpose of separating bacteria from their products of growth. Bacteria-proof filters furnish an important means of studying the toxins, which may be removed by filtration from cultures of bacteria, and from lesions where the specific cause has not been cultivated.

In 1898 Loeffler and Frosch, while trying to obtain toxic material for immunity experiments from lesions of foot-and-mouth disease, discovered that the virus of the disease would pass through the finest porcelain filters, and this observation marks the beginning of the series of investigations which have been made with respect to the filterability of viruses. Independently and shortly after Beijerinck discovered that a disease of the tobacco plant, the mosaic disease, was produced by a virus which would pass through the finest porcelain filters. He believed the virus to be in a fluid state "contagium fluidum," and through reasoning, not now tenable, convinced himself that living matter could exist in an unorganized or fluid state. Following Beijerinck's publication came one by Iwanowski, who made and substantiated the claim that he had previously, in 1892, demonstrated the filterability of the virus of mosaic disease. From this time on data respecting the filterability of viruses accumulated rapidly.

The term "ultramicroscopic" is often used as synonymous with "filterable," but filterability does not necessarily mean that the virus cannot be made visible in some stage of its growth, or by methods of illumination now employed. There is one virus—that of the pleuropneumonia of cattle—which passes through the Berkefeld and coarser porcelain filters, which may be seen by direct observation with the best optical equipment, using transmitted light, with a magnification of 1,500 diameters. The dark field method of illumination and the ultramicroscope, of course, will demonstrate particles in fluid which are but a few times larger than protein molecules. The delicacy of the ultramicroscope is such that repeated distillation in silver vessels is necessary to obtain water free from particles which disperse light. With this method of illumination small particles appear as luminous points, and it is, of course, impossible to distinguish minute organisms, such as filterable viruses, from the myriads of particles which are necessarily contained in fluids available for study.

The possibility of studying the visible viruses by direct methods of illumination seems to be hopeless inasmuch as the very nature of light limits the size of objects that may be studied to two-tenths of a micron. Effort to overcome this difficulty has resulted in the apparatus which employs light of short wave-length—ultra-violet light having half the wave-length of yellow light. This actually doubles the resolving power of the microscope, reducing the limit of size of particles that may be studied to about one-tenth of a micron. But, as observations with the ultra-violet apparatus can be made only through the medium of photographic plates, it has, as yet, added nothing to the study of the filterable viruses.

There are a few facts which offer encouragement for effort toward demonstrating the filterable viruses. Novy, in 1906, claimed to have shown that the trypanosomes of rats (*T. Lewisi*), and of the African cattle disease (*T. Brucei*), and the spirochæte of European relapsing fever in man have stages which pass through the Berkefeld filters. The details of his experiments are very meagre, and the control methods employed are not stated. Bruce, who worked with cultures of the rat trypanosome, with blood of animals infected with the same and with cattle (*T. Evansi* and *T. Brucei*) and human (*T. gambiense*) trypanosomes, was not able to confirm Novy's results. Later he attempted to show the

* From the *Boston Medical and Surgical Journal*, September 26, 1912.

existence of a filterable state in tsetse flies which were infected with *T. gambiense*, but with negative results. The important bearing of this question upon the subject of filterable virus impelled Dr. Wolbach with Mr. Stevens to repeat Novy's experiments with trypanosomes, with entirely negative results. Breinl and Kinghorn, who worked at the Liverpool School of Tropical Medicine, claim to have obtained infective filtrates from the blood of animals containing the spirochæte of African relapsing fever. As the spirochæte of African relapsing fever has an unknown cycle of development in the intermediate host—a tick—these results are compatible with the failure to optically demonstrate this stage. Borrel, working with lymph from the lesions of sheep-pox, obtained a minute flagellated protozoan in filtrates, and he showed that this organism, which he called "*Micromonas Mesnili*," would pass through bacteria-proof filters, at least in some stage of its development. There is also another protozoan which has a filterable stage. The only published reference to it is in a discussion by Professor Lœffler, who said that Dr. Spiegel, working in Emmerich's laboratory, has shown that spores of a flagellate, belonging to the genus Bodo, as defined by Dofflein, would pass through Berkefeld filters which prevented the passage of *Bacillus prodigiosus*, even after an hour's filtration. It, therefore, seems possible that at least a few of the filterable viruses, causing disease, may have a stage which is visible by means of the ordinary microscope and particularly those viruses which are transmitted by intermediate hosts, and which are, therefore, probably spirochætes or protozoal.

Dr. Wolbach groups the diseases produced by filterable viruses according to the nature of the host. The largest list is that of domestic animals. It includes pleuropneumonia of cattle, African horse sickness, sheep-pox, cattle plague, hog cholera, swamp fever of horses, an infectious disease of sheep and goats, causing suppression of milk (infectious agalactia), catarrhal fever of sheep, or blue tongue, distemper of dogs, infectious stomatitis papulosa of cattle, guinea-pig epizoötic, a peculiar paralysis of guinea-pigs, and a rat disease. A few diseases are common to man and animals, or at least are intercommunicable. These are foot-and-mouth disease, rabies, vaccinia and variola. The diseases peculiar to man are yellow fever, molluscum contagiosum, dengue fever, verruca vulgaris, trachoma, sand-fly or three-day fever, poliomyelitis, typhus fever, measles, and scarlet fever. In birds there are: fowl pest, fowl diphtheria, which has recently been shown to be due to the same virus as epithelioma contagiosum of fowls, and the chicken sarcoma, which was recently described by P. Rous. In plants there is so far only the mosaic disease of the tobacco plant.

Man.

Yellow Fever.

Characterization.—An acute febrile disease with severe blood destruction, endemic in tropical countries.

Transmission.—By mosquitoes, the *Stegomyia fasciata*. The virus is found in the blood only during the first three days of the disease. "An interval of about twelve days or more after contamination appears to be necessary before the mosquito is capable of conveying the infection."

The filterable nature of the virus was discovered by Reed and Carroll and their associates in 1901. The virus passes through Berkefeld and Chamberland B filters. It is destroyed by a temperature of 55° C. in ten minutes, and by exposure to the air at a temperature of 24° to 30° C. in forty-eight hours. One attack confers complete immunity. Passive immunity has not been achieved.

Molluscum Contagiosum.

Characterization.—Infectious epithelial tumours which undergo a central colloid degeneration, thus giving rise to the "molluscum bodies," which may be squeezed out as small, hard white masses. It is a purely local infection.

Transmission.—By contact, probably requiring a break in the epidermis for entrance of the virus.

The filterability of the virus was discovered by Juliusberg in 1905. It passes through Chamberland filters. It is found in the degenerated epithelium.

Dengue Fever.

Characterization.—An infectious febrile disease of the tropics, characterized by an initial fever with erythema and rheumatoid pains in the joints, a short interval of well being, a terminal fever similar to the initial and crisis. The whole disease lasts from six to twelve days. The mortality is very low.

Transmission.—By mosquitoes—the *Culex fatigans*. The virus is in the blood-stream. Its filterability was discovered by Ashburn and Craig in 1907. It passes through Berkefeld filters which are impervious to *Micrococcus melitensis*. The properties of the virus are unknown.

One attack of the disease usually gives immunity for one to a few years. The possibilities of passive immunity have not been touched.

Verruca Vulgaris.

The filterable nature of the virus is claimed by Ciuffo. It is said to pass through Berkefeld filters N and W.

Cultures have not been obtained.

Trachoma.

Characterization.—An infectious inflammatory disease of the conjunctiva characterized by its resistance to treatment and the production of macroscopic nodules of lymphoid tissue in the palpebral conjunctiva.

Transmission.—By contact with the discharges from the conjunctiva. The filterable nature of the virus was discovered by Bertrelli and Cecchetto in 1908. The monkey is susceptible. The virus passes through Berkefeld filters. It has not been culti-

vated, nor have its properties been determined in regard to physical and chemical agents.

Sand-fly Fever or Three-day Fever.

Characterization.—A benign fever of all tropical countries of three days' duration.

Transmission.—By the sand-fly—*Phlebotomus papatasii.*

The virus is found in the blood during the first day of the fever. Its filterability through Berkefeld filters was discovered by Doerr in 1908. It may be preserved outside the body for three and one-half days, but its other properties have not been determined.

Cultures have not been obtained.

Immunity.—Complete after one attack. No effort has been made toward establishing passive immunity.

Poliomyelitis.

Characterization.—An acute infectious febrile disease of children and young adults. Characterized by a rapid atrophic paralysis of groups of skeletal muscles.

Transmission.—Unknown. Experimentally by intracraneal and intraperitoneal inoculations of the virus. The virus is most concentrated in the central nervous system, but is found also in various organs, the nasal mucosa, and the blood. Natural transmission possibly occurs through an intermediate host.

The filterability of the virus was discovered independently and almost simultaneously by Lentz, Landsteiner, and Levaditi, and Flexner and Lewis in 1909. It passes through Berkefeld and Chamberland filters.

Cultivation of the virus has not been achieved. The virus resists glycerine for a month, drying over caustic potash, freezing at – 2° to 4° C., for weeks, autolysis of tissue and growth of moulds. It is destroyed by a temperature of 45° to 50° C. in half an hour. It is easily destroyed by antiseptics; 1 per cent. solutions of hydrogen peroxide and menthol are effective.

There are no cell inclusions characteristic of the disease.

Artificial immunity has been achieved through injections of graded doses of the virus. Flexner and Lewis have obtained a slight degree of passive immunity in monkeys.

Measles.

The filterability of the virus was discovered by Goldberger and Anderson in 1911. The virus is found in the blood, buccal and nasal secretions. It passes through Berkefeld filters. The disease is communicable to monkeys.

The virus resists drying for twenty-four hours, preservation at 15° C. for twenty-four hours, and freezing for the same length of time. It is destroyed by a temperature of 55° C. in fifteen minutes. It has not been cultivated. There are no specific inclusions. Immunity follows recovery; no work on producing passive immunity has been reported.

Typhus Fever.

Characterization.—An acute infectious disease occurring in epidemics, characterized by suddenness of onset, a macular eruption, prostration, and a fairly definite course ending by crisis.

Transmission.—Both the typhus fever of Europe and America (Mexican) are transmitted by the body louse (*Pediculus vestimenti*). The filterability of the European virus through the coarser Berkefeld filters was discovered by Nicolle in 1910. Ricketts and his associates did not get infective filtrates with the American virus. Nicolle explains this on the ground that they used the serum from centrifugalized defibrinated blood, while he used the serum from spontaneously coagulated blood, and the most permeable of the bacteria-proof filters. The bacillus of chicken cholera was used for the test bacterium.

The disease is communicable to monkeys. The virus is found in the blood and is most virulent towards the end of the febrile period.

The virus is destroyed by a temperature of 52° to 55° C. It has not been cultivated.

Active immunity is very complete. The blood of animals which have recovered possesses transient protective properties. Ricketts and Wilder found in the blood of patients with Mexican typhus small numbers of minute bacilli. These bacilli measure about 2 by 0.6 microns, but are larger than the bacteria used by Nicolle as controls to his filtration experiments.

Scarlet Fever.

Cantacuzene and Bernhardt claim independently of each other to have given scarlet fever to the lower monkeys—*Macacus* and *Cercopithecus*. Landsteiner and Levaditi were not able to confirm these results, though they were successful with chimpanzees.

Bernhardt also claims to have infected monkeys with bacteria-free Berkefeld filtrates. These results have not yet been confirmed. Protozoan-like inclusions, now included by Prowazek among the chlamydozoa, were described by Mallory in 1904, in the skin lesions.

Animals and Man.

Foot-and-Mouth Disease.

Characterization.—A contagious disease of cattle and swine characterized by high temperature and eruption of vesicles in the mouth and around the coronet of the feet. Man is susceptible.

Transmission.—Contagious. The filterable nature of the virus was discovered by Lœffler and Frosch in 1898. Cell inclusions are found in the vesicles, and Siegel claims to have cultivated these inclusions, which he called "Cytorrhycetes." The virus passes through the coarser grades of porcelain filters. It has not been cultivated. It is destroyed at a temperature of 50° C. in ten minutes, drying in twenty-four hours, five weeks' freezing at – 8° to – 9° C., and very easily by ordinary disinfectants. Animals after recovery are immune. Pro-

tective inoculations are not successful. A certain degree of passive immunity is conferred by injections of serum from immune animals.

Rabies.

Characterization.—An infectious disease of animals, communicable to man and most common in dogs, characterized by acute onset of mental and nervous symptoms with paralysis, and high mortality.

Transmission.—The virus must enter through a break in the skin, and is usually transmitted by bites from infected animals. The virus is found in the central nervous system, secretion of the salivary, lachrymal, and mammary glands, in the pancreas, and occasionally in the blood, cerebrospinal fluid, and aqueous humor.

The virus resists room temperature without drying for months, freezing at − 16° to − 35° C., glycerine for months, putrefaction, and drying if kept in vacuo in a dark place for months.

The virulence is progressively destroyed to a complete loss in fourteen to fifteen days. The virus is destroyed by a temperature of 55° to 58° C. in half an hour. It is easily destroyed by disinfectants, such as 1:1,000 corrosive sublimate, 1 per cent. potassium permanganate, 2 per cent. sulphuric acid, and 1 per cent. creolin. It is destroyed by gastric juice in four and a half hours, and by bile in a few minutes.

Cultivation of the virus has not been achieved. Inclusions which are practically specific for the disease were first described by Negri in 1903.

Artificial immunity is satisfactorily accomplished by injections of doses of the virus in increasing strengths. Passive immunity has not been accomplished.

Variola and Vaccinia.

Characterization of Variola.—An acute febrile disease of man occurring in epidemics, characterized by a papular, vesicular, and pustular eruption.

Transmission.—Highly contagious. The filterable nature of vaccinia was first discovered by Siegel and confirmed by Negri in 1905. The virus of smallpox was first shown to be filterable by Casagrandi. The viruses are now regarded as identical. They pass through Berkefeld filters and the coarser grades of Chamberland filters. The virus is found in the cutaneous lesions. It resists drying for weeks, and glycerine for eight to ten months. It is destroyed by a temperature of 57° to 58° C. in fifteen minutes, and easily by most disinfectants. It is also destroyed by saponin, ricin, bile, taurocholic acid, and sodium-oleate. The virus has not been cultivated. Certain forms of inclusions described by Guarnieri in 1892, and most carefully studied by Tyzzer and Councilman, Magrath and Brinckerhoff are practically specific for vaccinia and variola. Their parasitic nature is accepted by Prowazek, and they are grouped by him with the "chlamydozoa," but to most authorities this interpretation remains unproved.

Recovery from either vaccinia or variola gives complete immunity of long duration to either form of infection. Passive immunity has not been achieved.

Wolbach believes that an investigation of the properties and behaviour of the filtered viruses shows that a somewhat significant grouping is possible.

One group is transmitted by intermediate hosts: biting insects of some sort. The mosquito transmits African horse sickness, yellow fever, and dengue fever. Sand-fly fever is transmitted by a midge (*Phlebotomus*), and typhus fever by a body louse. Experiments have proved almost beyond doubt that the swamp fever of horses and the catarrhal fever of sheep are transmitted by an intermediate host as yet undiscovered. All of these diseases are essentially blood infections: diseases in which the parasite is primarily a blood parasite. It is quite possible, in the light of recent experimentation and statistical studies, that poliomyelitis requires an intermediate host for its transmission.

One group of diseases requires entrance of the virus directly into the tissue through an abrasion or injury to the surface of the body. This group includes rabies, molluscum contagiosum, verruca vulgaris, chicken sarcoma, and probably trachoma, though it is possible that the last may effect a hold on a normal conjunctiva.

One group is transmitted by contact, which, of course, means contamination with infected material, such as discharges from the eyes, respiratory tract, surface lesions, and excreta. This includes: pleuropneumonia of cattle, cattle plague, distemper of dogs, fowl pest, fowl diphtheria, infectious stomatitis papulosa of cattle, and the infectious agalactia of sheep and goats. Contagious or possible "airborn" diseases with filterable viruses are sheep-pox, hog-cholera, measles, foot-and-mouth disease, variola, and scarlet fever.

The methods of transmission of guinea-pig epizoötic, guinea-pig paralysis, and Novy's rat disease are unknown.

A number of these diseases, under which are included the most contagious, as foot-and-mouth disease, variola, sheep-pox, hog-cholera, measles, and scarlet fever, and others less easily communicated, such as rabies, trachoma, molluscum contagiosum, distemper of dogs, fowl pest, and epithelioma contagiosum of fowls, have associated in the lesions, cell inclusions which are more or less specific for the particular disease. Prowazek has given particular attention to these cell inclusions, and has created for them the name "Chlamydozoa" in the belief that these inclusions are parasitic, a view held by comparatively few pathologists and bacteriologists. In the case of trachoma he maintains that the minute granules, which make up the trachoma body, are the infective agents which pass through the filter. Wolbach and McKee, however, have shown that trachoma bodies containing these granules are only the product of pathological mucous secretion, and so the probability of the inclusions being parasitic is disproved. It is true, however, that in all the diseases where the filterable virus is

contained in cutaneous lesions, special effort must be made to thoroughly break up the tissue cells, before an infectious filtrate can be obtained; this is likewise true of rabies.

Prowazek argues that the cells must be broken and the inclusions themselves disintegrated in order that the filterable forms may be set free. In fowl pest the virus has been cultivated, which is another argument against the inclusions being parasitic.

In small-pox, sheep-pox, and foot-and-mouth disease the viruses are found only in the eruptive lesions, and are all resistant to glycerine. Somewhat similar cell inclusions are found in all. In distemper of dogs, fowl pest, rabies, poliomyelitis, and guinea-pig paralysis the virus shows a preference for the central nervous system; in the first three cell inclusions are found in nerve cells; in the last three the viruses are resistant to glycerine.

Cultivation experiments with filterable viruses have been fruitless, with the exception of pleuropneumonia of cattle, fowl pest, fowl diphtheria and epithelioma contagiosum and Novy's rat disease. The viruses of these diseases have been cultivated without question. The organism of pleuropneumonia of cattle is exceedingly polymorphous, the commonest forms are small spirochætes which occur singly and in clusters. There are also short coccus-like forms. The other cultivated viruses reveal their presence only through the infectivity of subcultures carried beyond any reasonable limit of dilution from the original.

Some light on the probable nature of filterable viruses, whether protozoal or bacterial, may be obtained from the study of their behaviour to various chemical and physical agents. In general, they are destroyed at a much lower temperature than bacteria, but several are rather resistant, particularly the mosaic disease of the tobacco plant, African horse sickness, hog-cholera, and fowl diphtheria. They are in general more resistant to the action of glycerine, and here again those associated with inclusions seem to be the most resistant, although we have no data regarding the resistance of *the viruses* of molluscum contagiosum, verruca vulgaris, trachoma, and distemper. In a few instances it has been shown that the filterable viruses are more easily destroyed by certain substances than are bacteria. These substances include saponin, ricin, bile, and bile salts, but as the data include only sixteen of the viruses, these tests are not of importance in a general argument. A bacterium, the pneumococcus, is destroyed by bile, a fact which detracts from the value of these tests.

One rather striking feature of the diseases with filterable viruses is the nature of the immunity. In nearly every instance immunity is complete and of long duration, and in many instances artificial immunity has been achieved through protective inoculations. In nearly every instance successful passive immunity has not been obtained, which would indicate that, unlike most bacteria, these viruses produce but little in the way of toxins.

Bacteria play an important secondary *rôle* in some diseases caused by filterable viruses; it is even probable that the typical disease picture is produced only by the combined effect of the filterable virus and bacteria. These diseases are: hog-cholera, distemper of dogs, the guinea-pig epizoötic of Petrie and O'Brien, and scarlet fever. The association of the bacterium with the disease has been so close in the case of hog-cholera that for many years *Bacillus suipestifer* was supposed to be the sole cause; just as now many believe the streptococcus to be the cause of scarlet fever, and various bacilli the cause of distemper of dogs.

This brief outline and analysis of the subject of filterable viruses, Wolbach thinks, would indicate that certain of them are bacterial in nature, because of their resistance to physical and chemical agents, and because four of them have been cultivated. The fact that there is a group that is transmitted only by biting insects would indicate that some of them are protozoal in nature. This seems most probable in view of the filtration of protozoa which has been accomplished by Borrel and Spiegel. The fact that spirochætes have been filtered suggests that certain of the diseases transmitted by intermediate hosts may be due to spirochætes, and particularly some of the diseases of animals.

From the grouping of these diseases, which is possible with respect to the manner of transmission, localization of the virus in the tissues and properties of the viruses in respect to physical and chemical agents, Wolbach thinks that one may predict that at least some of the diseases which fall into a given group are caused by very similar microorganisms; and that the actual demonstration of the parasite, or its culture, of one disease will mean a ready solution for others of the same group. It is quite possible that when our knowledge of filterable viruses is more complete, the conception of living matter will change considerably, and scientists will cease to attempt to classify the filterable viruses as animal or plant. The extreme minuteness of certain of these viruses, which cannot be thrown down by prolonged centrifugalization with the most powerful machines, and which pass through the finest porcelain filters, suggests that some of their properties may be due to this very minuteness in size; and that like the colloid solution of metals, which behave in some respects like enzymes, a part of their activities and even pathogenic effect may be due to physical phenomena, such as surface action. The extreme minuteness may also account for the contagious nature of certain diseases, because it has been recently shown that minute particles suspended in air or liquid obey the laws which govern the diffusion of gases and of substances in solution in liquids.

"Bulletin de la Société Medico-Chirurgicale de l'Indochine," tome iii, October, 1912, No. 8.

Amœbiasis.—Dagorn and Heymann report a case of amœbic abscess of the liver, followed by phagedena of the operation wound and cutaneous amœbic abscesses. Such a condition is very rare.

Notes and News.

The Society of Tropical Medicine and Hygiene.—At a meeting of the Society of Tropical Medicine and Hygiene, held at 11, Chandos Street, Cavendish Square, London, W., on Friday, November 15, 1912, the following gentlemen were elected Fellows of the Society: H. R. Carter, M.D., Panama; H. Curwen, M.B., Zanzibar; J. T. C. Johnson, F.R.C.S.Ed., Hong Kong; A. Leslie Sheather, London; Staff-Surgeon H. Cadman Whiteside, Admiralty.

OFFICIAL NOTICE TO SHIPOWNERS.

The attention of shipowners is called to the following recommendation made by a Committee appointed by the Board of Trade to revise the medical scales for merchant vessels:—

"Our attention has been called to the absence on board cargo vessels of any separate accommodation for members of the crew who fall ill or meet with accidents.

"We are of opinion that it would be very desirable that some suitable provision should be made on board all ocean-going vessels for the separate and reserved accommodation of sick persons, and trust the Board will see fit to use its influence with shipowners in this direction."

The Board of Trade strongly support this recommendation, and as it is framed in the interests of shipowners as well as of crews, and the Board have ascertained on inquiry that it meets with the approval of the majority of the owners of ocean-going cargo vessels, they feel confident that the recommendation will commend itself for adoption as far as practicable by such shipowners.

The Board desire it to be generally known that the owner of any vessel in which separate and reserved accommodation for sick or disabled seamen is suitably provided, and the Board's Surveyors are satisfied that it complies as regards floor area, cubic capacity, construction, lighting, ventilation, &c., with the Board's regulations as to crew space, is entitled to have it certified as "Crew's hospital" and included with the deductions made on account of crew space from the gross tonnage of the vessel.

Revised scales of medicines and medical stores and instruments have been recommended by the Committee and adopted by the Board and come into force at once. The various revised scales have been issued together in a single pamphlet, which can be purchased (price threepence) either directly or through any bookseller, from Messrs. Wyman and Sons, Ltd., Fetter Lane, London, E.C., or Messrs. Oliver and Boyd, Tweeddale Court, Edinburgh, or Messrs. Ponsonby, Ltd., 116, Grafton Street, Dublin.

A new edition of the "Ship Captain's Medical Guide" referred to in the scales will shortly be issued by the Board of Trade, and, as stated in the scales, a copy of the latest edition should be on every ship provided with the medicines, &c., specified in the scales.

Walter J. Howell,
Assistant Secretary.

Marine Department,
Board of Trade,
January, 1912.

Reviews.

The Ship Captain's Medical Guide. (For official use. Issued by the Board of Trade.) Edited by Charles Burland, M.D., F.R.G.S., Senior Medical Inspector of the Board of Trade. London: Wyman and Sons, Ltd., Fetter Lane, E.C.; Oliver and Boyd, Tweeddale Court, Edinburgh; or E. Ponsonby, Ltd., 116, Grafton Street, Dublin. Price 2s.

This useful guide should be in the hands of all ship captains and others who go to sea in vessels without a doctor on board. There is no reason why a copy should not be kept on board even in ships that do carry medical attendants, because the book contains much useful medical information, especially on tropical diseases. Originally compiled many years ago by the late Dr. Harry Leach, M.O.H. for the Port of London, and Physician to the "Dreadnought" Seamen's Hospital, the text was subsequently improved by Dr. William Spooner, Senior Medical Inspector of the Board of Trade, and now again it has been revised and brought up to date, as a 15th edition, under the editorship of Dr. Charles Burland, another Senior Medical Inspector of the Board of Trade. As the author says in his preface, medical science is ever advancing, and as progressive research sheds increasing light on matters hitherto imperfectly or wrongly understood, long held theories pass into oblivion and gradually become replaced by more accurate knowledge.

This, of course, is specially the case with tropical diseases, and no book can in any way be up-to-date which does not include a synopsis of the recent work and discoveries in malaria, plague, cholera, and beri-beri, to quote only a few of the more important of these maladies. The author has appreciated the fact, and has brought the book thoroughly up-to-date in this respect. A very beneficial introduction is that of getting men with special tropical training to write on some of the tropical subjects.

Dr. Sandwith, for example, contributes a very useful synopsis on beri-beri, a disease above all others difficult of comprehension by the layman, and also one of frequent occurrence on ships and steamers.

A few useful hints on the treatment of this scourge, as given in the manual, may be the means of saving many lives. The author's suggestion for the renewing the woodwork of unclean wooden bunks, in case this may be a predisposing factor for

the production of beri-beri, is a wise one, and that especially so, as it should tend to the diminution of bugs, lice, fleas, and other parasites, all of which have now been proved to be capable vectors of many important diseases, such as plague, relapsing fever, &c. The other parts of the work devoted to ordinary diseases, medicines, recipes, diet, and dosage are written in such a manner that they should be perfectly clear even to the most obtuse brains. The manual is a most interesting one, and deserves to be known in circles more extended than those for which it was primarily written.

G. C. L.

CARE AND TREATMENT OF EUROPEAN CHILDREN IN THE TROPICS. By G. Montagu Harston, M.D. Lond., M.R.C.S.Eng., L.R.C.P.Lond., with Introduction by Sir Patrick Manson, G.C.M.G. London: Baillière, Tindall and Cox, 8, Henrietta Street, Covent Garden. 1912. 7s. 6d. net.

This book supplies a distinct want. It contains a description of tropical diseases as met with in children. As the signs and symptoms of these diseases, and in addition the treatment, vary so greatly when children are being dealt with, it is essential that the young man commencing practice in the Tropics should have his attention specially drawn to these points. This Dr. Harston has certainly succeeded in doing. A careful study of his book plus the scientific knowledge of tropical diseases acquired in any of the laboratories of the Tropical Schools should quickly make anyone competent to treat children in the Tropics. In addition to treatment very good *résumés* are given of the etiology of the different diseases, and the book forms very pleasant and instructive reading. As Sir Patrick Manson says in his introductory remarks, there will be a good deal of criticism probably on some of Dr. Harston's views as regards treatment, but the result of this should do good in thoroughly ventilating the matter and in bringing more light to bear upon the subject which, up to now, has been much neglected and little written upon.

G. C. L.

TRYPANOSOMES ET TRYPANOSOMIASES, par A. Laveran, Professeur à l'Institut Pasteur, Membre de l'Institut, &c., et F. Mesnil, Professeur à l'Institut Pasteur. Paris: Masson et Cie. 1912.

Professors Laveran and Mesnil are to be congratulated on the second edition of their book on trypanosomes. The first edition is well known in this country through Dr. Nabarro's excellent translation; it is to be hoped that the second edition —in which there is much that is new—may also receive his attention.

The work, which contains 999 pages, with numerous drawings and plates, is divided into two parts. Part I—to which are devoted the first ten chapters—gives a general account of the subject; it contains chapters on Geographical Distribution, Technique for the Study of Trypanosomes, Trypanosomes in Vertebrate and Invertebrate Hosts, Cultural Methods, General Classification of Trypanosomes, General Pathology, General Therapeutic Methods, Identification and Classification of Trypanosomes.

Part II—Chapters xi to xxxv—deals with trypanosomes as agents of disease, in human beings and in the lower animals. Each species of trypanosome is studied in a very complete manner, morphologically and biologically; the course of each disease is traced with great accuracy and the various treatments are described in detail.

The book is certainly the most complete and up-to-date work we have on the subject, and is thoroughly worthy of its well-known authors, both of whom have taken such prominent part in the scientific investigation of trypanosomes and the diseases caused by them.

J. C.

Correspondence.

To the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

DEAR SIRS,—May I point out that the cases of Blackwater Fever published on pages 289-91 of the Journal, October 1, 1912, are in continuation of the cases published in the Journal, March 15, 1912, and not September 15, 1911, as stated on page 289.

Dr. James's letter, published on page 292, refers to my article in the Journal, September 15, 1911. This article is a separate communication from that published in the Journal, March 15, 1912, and now continued in the issue for October 1, 1912.

Yours faithfully,

LAWRENCE G. FINK.

Myaungmya, Burma,
November 1, 1912.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

CONCERNING THE ORIGIN AND SIGNIFICANCE OF LEISHMAN'S CHROME-CELLS IN BLACKWATER FEVER (THE BASOPHILE GRANULAR LEUCOCYTE OF EHRLICH).

By Dr. V. SCHILLING-TORGAU.

Assistant to the Institute für Schiffs- und Tropenkrankheiten in Hamburg.

LEISHMAN has drawn attention in certain of his publications [1, 2] to hitherto, in his opinion, unknown cells in the blood of people suffering from blackwater fever. He describes these cells as of a specially dark chromatin colour, not only the nucleus, but also the protoplasm, showing this dark red chromatin tone. The nucleus may be either mononuclear or polynuclear. The red colouring matter is often particularly marked in the periphery of the cells and diffuses into the protoplasm around them. The reference is as follows:—

(*Vide* Literature [1], p. 30): "The red colour was most intense at the periphery, giving the cell an appearance of being capsulated." Further, he observed that the protoplasm of the cells which were broken was filled with dark red granules which were often ring-shaped. His original conclusion was that he was dealing with a parasitic inclusion which might be an etiological factor in blackwater fever. This was disproved by the researches of Thomson (*vide* Literature [2], p. 15), who recognized these as degenerated "mast-cells." Leishman nevertheless proposed a theory concerning the origin of these peculiar cells, and this may prove to be of value. The coloured plate illustrating this paper is from my book (*vide* Literature [3]) (coloured plate II, figs. 23-29), in which on page 49 I demonstrated quite shortly the different appearances of these cells which are the basophile-granular leucocytes of Ehrlich.

This basophile-granular leucocyte is rare, and is hardly ever found in normal blood in numbers exceeding .5 to 1 per cent. This percentage is raised in leucæmia or polycythæmia. I have drawn attention to its comparative frequency, up to 3 per cent., in beri-beri, especially in Chinese convalescents (*vide* Literature [3], p. 61), and have since then found repeatedly a small increase in the blood of natives and inhabitants of tropical countries, who mostly suffer with "worm" infections, together with a slight eosinophilia—(2 to 3 per cent.). We are not yet so fully acquainted with the details of the pathological origin of leucocytic basophilia as of eosinophilia.

It is astonishing that these cells should have escaped the notice of blood analysts for so long, but it is explained by their extreme variability of colour and form as demonstrated by Romanowsky's various methods.

The morphological blood picture offers to the specialist ever increasing surprises. I believe that the following particulars to which Leishman has drawn attention, though not altogether new, are of importance:—

The true form of the basophile leucocyte is seldom observed by the Romanowsky's method. This is not the fault of the staining, which is very appropriate for these cells, but rather of the process of fixing and subsequent treatment. The mere making of the smear causes no special injury to the cells. According to my experience the best stain, following the Romanowsky principle, is the new Giemsa-acetone quick-staining process. One mixes the well-known Giemsa solution with equal quantities of pure acetone, and places fifteen drops of the mixture on an air-dried preparation, not more than forty-eight hours old, at the bottom of a carefully sterilized Petrie dish. After about a minute 15 c.c. of distilled water is poured into the dish, mixed and left there for five minutes, after which time it is washed out under the tap and the preparation dried in the usual way.

The few basophile leucocytes will then look exactly as in my illustrations Nos. 2 to 4.

In a transparent pale blue or grey protoplasm we may observe fairly regular granules of an intense violet red arranged around a paler mono- or polynuclear nucleus. These cells are very striking, the acetone preparation preserving the morphological characteristics splendidly. Certain metamorphoses which we will now discuss are artificial products.

If we stain the specimens of blood, in which basophile leucocytes are present, by the usual Giemsa method, the delicate granules nearly always remain invisible. The basophile granules can only be very partially protected from the influence of the water during the twenty minutes or longer the staining is in progress, and the use of alcohol-ether or pure alcohol is hardly ever efficacious.

This process on the other hand preserves the Leishman chrome-cells exactly as the author has portrayed them in his plates, and as I have reproduced them in colours.

Leishman's figs. 1 and 2 correspond to my figs. 5 and 6, his figs. 3 and 4 to my fig. 7. Fig. 6 is encapsulated. The annular appearance of the enclosed portions is shown in fig. 7, which reproduces a crushed cell.

The secret of the variability of these cells lies in the solubility in water of their probably mucoid secretions, which many hæmatologists (*cf.* Pappenheim) consider are not identical with the granules of the other granulocytes, chiefly because it can be proved that they are derived from lymphocytic cells (*cf.* Downey and Weidenreich).

The granules are either quite dissolved, having little vacuoles in the protoplasm (figs. 5 and 6), or else there remain little annular portions of matter in the round vacuoles.

The diffused colouring matter tints the cytoplasm, sometimes also the adjacent serum intensely "chromatin" red, which was well described by Leishman. Sometimes the denser ectoplasm takes up the red substance and collects it in the periphery. Also the nucleus of these cells, which is

directly active in the formation of these substances, according to the hæmatologists, shows the same solubility and is often not distinctly visible (fig. 6).

The rudiments of these cells are found with the same characteristics in the hæmopoietic organs (figs. 1 and 2). The cells are often damaged in course of preparation of the specimen (fig. 7).

Finally, if I may express an opinion on the cell inclusions in blackwater fever, which have been described by Leishman, and are by no means of the same origin, I agree with Wenyon that the larger are normoblastic nuclei. At least, I have often seen all kinds of endothelial mononuclears with remains of phagocytic normoblastic nuclei, " or single nuclei," in cases of such severe irritation of the spinal marrow as blackwater fever and malignant malaria.

The smaller inclusions in blackwater fever, and those described by Low in cases of pellagra, cannot be differentiated from the well-known plasmosomes of Wolf and Ferrata which have been specially studied by Ferrata and Pappenheim. In all malaria patients and many others they can be found in very large numbers, and in irritative conditions of the hæmopoietic organs they appear conspicuously in the cells which are partly formed by the spleen. The immature basophil granules, often the so-called promyelocytes, the primary stages of the real myelocytes, possess a certain resemblance to the inclusions of the chlamydozoa, especially in their first stage inside the cell. I have found these cells where aggravated symptoms of blackwater fever and malaria were present on several occasions, but in no case have I seen any other bodies which might lead one to the conclusion that they had any connection with chlamydozoa.

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[2] W. LEISHMAN : " The Etiology of Blackwater Fever." *Transactions Soc. Trop. Med. and Hyg.*, vol. vi, H. 1; with discussion by Wenyon and others, November, 1912.

[3] V. SCHILLING-TORGAU : " Das Blutbild und seine klinische Verwertung, mit Einschluss der Tropenkrankheiten," Gustav Fischer, Jena, April, 1912.

[4] G. C. LOW : " Cell Inclusions in the Blood of Blackwater Fever and other Tropical Diseases." *Journal of Tropical Medicine and Hygiene*, vol. xv, p. 161, June, 1912.

BERI-BERI IN INFANTS.

By ALLAN J. MCLAUGHLIN, M.D., Washington, D.C.

Past Assistant Surgeon, United States Public Health Service.

IT is strange that the significance of beri-beri as a factor in infant mortality should have been overlooked for so long a period.

In 1900 Clark [1] described an epidemic in a Foundlings' Home in Hong Kong, but those affected were not infants, being from 4 to 7 years of age.

Hirota [2] as far back as 1888 noted young infants suffering from a disease resembling beri-beri. Between 1891 and 1897 he noted thirty-eight cases suffering from the same symptoms, and at this time he declared the malady to be beri-beri.

Other Japanese workers [3] have fully confirmed Hirota's findings clinically and pathologically.

Infant mortality in the Philippines has always been a serious problem and has been studied for many years.

In a symposium on Infant Mortality held in Manila in 1886 [4], the prize paper described a disease which was called " taon " or " suba " by the native population, and which was considered to be identical with " infantile convulsions " or eclampsia.

In 1904 Guerrero [5] in an unpublished article came to the conclusion that " taon " was similar to the disease described by Hirota in Japan. The paper made a considerable impression and diagnoses of infantile beri-beri began to appear in the statistics. Guerrero had based his opinion upon clinical cases only, and the native doctors following his lead made their diagnosis without confirmation by necropsy. There was one exception to this: in 1908 José Albert described a case of infantile beri-beri clinically and gave the *post-mortem* findings.

The writer began a study of Philippine infant mortality in October, 1908. From a study of statistics the most striking feature was a very heavy death-rate from " convulsions," " bronchitis," " beri-beri," and " meningitis." I attempted first to find out to what causes the deaths attributed to convulsions and meningitis were really due. Cholera was prevalent at the time, and this disease was found to be responsible for some of the deaths. It was also demonstrated that meningitis was a very rare disease [6]. Cholera did not explain some of the deaths alleged to be due to convulsions and other unsatisfactory diagnoses, and the writer concluded to investigate further the relation between " infantile beri-beri," " acute bronchitis," " convulsions " of children, and cholera in children.

In this later investigation the writer was associated with Dr. Vernon L. Andrews, Assistant Professor of Pathology, Philippine Medical School. Our results were presented at the meeting of the Far Eastern Association of Tropical Medicine, and published in July, 1910 [7].

Some rather startling facts were brought out.

(1) In 1909, 48 per cent. of all deaths in the city of Manila occurred in infants under 1 year, in spite of the fact that 75 per cent. of these infants were breast-fed.

(2) That of 219 infants necropsied 124, or over 56 per cent., had died of a malady which we called infantile beri-beri.

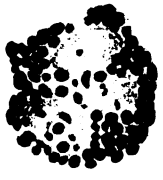
We showed further that the mothers of these children practically always had beri-beric symptoms or developed them at some time during pregnancy or lactation.

We emphasized the fact that beri-beri in infants was an economic question, and that it was caused in all probability by a lack of something in the mothers' milk, rather than by the presence of a toxin or other deleterious substance.

1

2

3



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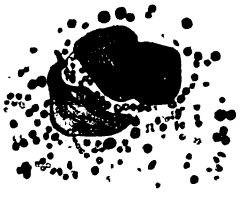

7

Basophile leucocytes, peripheral blood, Giemsa's stain.

CONCERNING THE ORIGIN AND SIGNIFICANCE OF LEISHMAN'S CHROME-CELLS IN BLACKWATER FEVER. By Dr. V. SCHILLING-TORGAU.

Three months later, Guerrero and Quintos [8] published a monograph reporting 175 clinical cases and two necropsies. The necropsies were performed twenty-two and thirty-two hours respectively after death, and their pathological findings were probably obscured by decomposition and, consequently, questionable. Their clinical studies were minute and comprehensive. They concluded that death of the infants was due to infantile beri-beri, but that the disease was caused by a toxin in the mothers' milk.

After leaving the Philippine Islands, my colleague Andrews [9] prosecuted the work further, and he confirmed our previous findings.

His conclusions were as follows :—

(1) The high infant mortality in Manila is due to infantile beri-beri.

(2) This high death-rate is due primarily to the quality of the mothers' milk.

(3) The mothers' milk lacks something which is essential for the growth and development of the nerves of the child.

(4) The infection is not due to an infection or toxæmia of either the mother or the child.

The demonstration of the *rôle* played by beri-beri in infant mortality in Manila has opened the way for a preventive campaign which promises brilliant results.

Fortunately, beri-beri is a preventable disease, and, further, its prevention is extremely simple.

With our present knowledge of the ætiology of beri-beri we would naturally treat the mother during pregnancy and lactation in order to protect the child. This treatment need only consist in substituting undermilled for polished rice, or in supplying in the mothers' dietary some constituent to take the place of those elements contained in the pericarp, the lack of which produces beri-beri.

Recently Chamberlain and Vedder [10] confirmed our findings that "taon" or "suba" is one of the chief causes of infant mortality, and state that the disease is beri-beri.

They suggest that the treatment should be administered to the child directly, and report fifteen cases treated with an extract of rice polishings with recovery in all cases. Concerning these cases they say: "A malady, called by the natives taon, taol, and suba, is one of the chief causes of infantile mortality in the Philippines. The disease usually occurs in the first four months of life, and is considered by many, including ourselves, to be infantile beri-beri. Most of the mothers show some symptoms of beri-beri; the children nearly always die if they continue to feed at the breast, and they usually recover promptly if given modified cows' milk or canned milk. To fifteen infants having the disease, and which continued to take the breast, we have administered the extract of rice polishings that prevents neuritis of fowls. Prompt and complete recovery occurred in all.

"The rapidity with which these patients recover reminds one of the marvellous improvement which follows the use of fruit juices in infantile scorbutus. The extract is easy to make, is inexpensive, is agreeable to the infant palate, and cures the child while it continues to nurse the mother. If the present promise is fulfilled we believe that the use of this extract of rice polishings will lead to a very marked decrease in infant mortality in the Philippines."

The substitution of unpolished or undermilled rice for the white or polished rice is not unattended by difficulty.

The Philippine Islands imports large quantities of rice, as the home crop is insufficient for the island population. The producers of rice are unwilling to change their methods of milling, and there has been difficulty in getting sufficient undermilled rice for the Government institutions. Many remedies have been suggested, but the most logical is one recommended by Dr. Victor G. Heiser. Dr. Heiser suggests that a tax of 2½ cents. per kilo. be placed on white rice, to be collected on the home product by the Internal Revenue Bureau, and to be collected on the imported rices by the Customs' officials. Whatever the solution may be, this much is certain—that brilliant results will follow the passing of the polished rice from the markets of the Philippines.

There will be not only a gradual disappearance of beri-beri from the islands, but also a marked reduction in the infant mortality.

The effect of this reduction of infant mortality upon the general death-rate may be appreciated if one considers that deaths of infants constitute at times 40 to 50 per cent. of the total deaths among the native population.

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POROCEPHALIASIS IN MAN.

By LOUIS W. SAMBON, M.D., F.Z.S.
Lecturer to the London School of Tropical Medicine.

(*Continued from p.* 327.)

IV.—*POROCEPHALUS CLAVATUS* (Wyman, 1845).

SYNONYMS.

Adult Form.

1847.—*Linguatula clavata*, Wyman.
1849.—*Linguatula proboscidea*, van Beneden (in part only).
1856.—*Pentastomum proboscideum*, Leidy (in part only).

1860.—*Pentastomum clavatum*, Leuckart.
1875.—*Pentastoma imperatoris*, Macalister.
1880.—*Pentastoma moniliformc*, Mégnin (in part only).

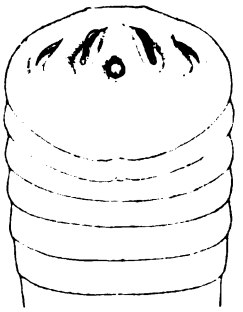

FIG. 8.—*P. moniliformis*, Magnified. Ventral aspect of Cephalothorax.

Nymphal Form.

1852.—*Pentastomum didelphidis virginianæ*, Leidy.

ZOOLOGICAL DISTRIBUTION.*

Adult Form.

**Boa constrictor* (Linn.), Common Boa.
Boa imperator (Daud), Emperor Boa.

Nymphal Form.

Didelphys virginiana (Shaw), Virginian Opossum.
Philander philander, Philander Opossum.

GEOGRAPHICAL DISTRIBUTION.

Central and South America.

HISTORICAL ACCOUNT.

This species, hitherto confounded with *Porocephalus crotali*, was first described by Jeffries Wyman at a meeting of the Boston Natural History Society, and published in the *Boston Journal of Natural History*, vol. v, 1845-7 issued in 1847.

After describing *Linguatula armillata* (= *Porocephalus armillatus*), Wyman gives the following account of the tongue-worm of the Boa:—

The second specimen (species?) was taken from the lungs of a South American Boa, to the surface of which it was adherent, in company with three or four others of a smaller size. It is 3½ in. in length, and nearly cylindrical in shape, largest in its anterior fourth, gradually diminishing in size towards its posterior extremity, where it terminates in a slightly dilated extremity. The integument forms indistinct annuli, not imbricated, which are deficient at the two extremities. The cavities containing hooks are four in number, as in the preceding species, and between them, on the median line, is situated the oral aperture. The anus is terminal. The smaller specimens did not exceed 1½ in. in length, and proved, on dissection, to be males. The large specimen which was not dissected was supposed to be a female, and, as in the other dicœcious entozoa, it greatly exceeds the male in size.

This species may be identical with the *Linguatula subcylindrica* of Diesing, to whose monograph on the Linguatula I have not had access. If it should prove to be a new species, I propose the name of *L. clavata*.

* Signifies that I have examined specimens of the parasite from the host in question.

In his "Recherches sur l'organisation et le développement des Linguatules," van Beneden (1849) gives a description of this parasite, which he terms *Linguatula proboscidea*, and many anatomical details, including the structure of the embryos which he was the first to observe, thanks to numerous specimens from the lungs of a Boa dissected by M. J. Kets, Director of the Antwerp Zoological Gardens. The description furnished by van Beneden is the following:—

These worms have likewise a cylindrical body, nevertheless a slight flattening may be seen on the ventral side; they swell slightly in the shape of a club at their posterior extremity.

Annulations are distinctly visible throughout the length of the body, except on the posterior portion, which is swollen, and therefore distended; these rings are far less marked in the females. We have counted from thirty-five to thirty-seven rings.

The body of the females is also far more swollen than that of the males: owing to the great development of the oviduct and ovary, the body rings become effaced, the skin becomes thinner and more transparent, the entire animal becomes softer, and one sees the circumvolutions of the sexual apparatus through the thickness of the skin."

E. Blanchard (1850) found several specimens of a tongue-worm, which he calls *Linguatula proboscidea*, in the lung of a Boa constrictor that died at the Museum's menagerie. He was thus able to study the anatomy of these tongue-worms.

Leidy (1852), under the name of *Pentastomum Didelphidis Virginianæ*, describes a nymphal tongue-worm of which he found nine specimens enclosed in C-shaped cysts, measuring 2 lines in diameter and embedded just beneath the peritoneal surface of the liver of a Virginian opossum (*Didelphys Virginiana*).

His description of the parasite is as follows: Body subcylindrical, curved, dorsally convex, ventrally concave, tapering posteriorly and constricted a short distance from the extremity, which is rounded. Colour white, opaque. Composed of forty or fewer annulations. Head posteriorly convex, anteriorly flat or slightly concave; mouth almost round, hooks simple, disposed in a curved line of which the mouth forms the centre. Whole length three to five lines; breadth, three-fifths of a line; annuli generally one-eightieth of an inch wide: mouth 1/200th inch in diameter; hooks 1/200th inch long.

Leidy suggests that this linguatulid might be the *Pentastomum subcylindricum* of Diesing found in other species of opossum, but points out that his tongue-worm presents about half the number of annulations.

In the same paper Leidy describes, under the name of *Pentastomum proboscideum*, a tongue-worm he found in the common Boa (*Boa constrictor*). His description is based on six female and four male specimens. It is as follows:—

Body sub-clavate, broadest anteriorly, recurved, posterior end dilated ovate, subacute. Colour yellowish-white, integument translucent. Annulations 36, becoming indistinct towards the posterior extremity. Head round, mouth round. Male furnished with two short projecting papillæ just above the mouth; penis papilliform, projecting one-fourth of a line.

Length of female, 2½ to 3½ in.; breadth of head, 2½ lines; narrowest part of body, 1 line, just anterior to posterior dilatation, which latter is 3 lines long by 1½ broad. Length of male, 1 in. 3 lines to 1 in. 5 lines; breadth of head, 1½ lines; narrowest part of body, ½ line; breadth of posterior dilatation, three-fifths of a line.

Professor A. Macalister (1877) described this species from *Boa imperator* at a meeting of the Royal Irish Academy on November 9, 1874. He says:—

In dissecting a specimen of *Boa imperator* brought home by Dr. Armstrong (of the Army Medical Service) from South America, I found in the lung and peritoneal cavity about six specimens of a Pentastoma. It resembles the *P. proboscideum* of Rudolphi, which has been found in the allied species *Boa constrictor*, as well as in *Epicrates angulifer*, *Lachesis* sp., and a species of *Bothrops*, but differs specifically from the type of *P. proboscideum*, as well as from the subtypical varieties of that species, *P. clavatum* of Wyman and *P. subcylindricum* of Diesing.

The specimens measure—the females 45 to 57 mm., the males 19 to 22 mm. in length. In breadth the females are 3.3 mm. at the head, 1.27 to 2.28 mm. at the narrowest point, which is the hinder fourth, and about 1.30 to 2.5 mm. at the tail. The males in width are a little less. The body is annulated posteriorly, but for the cephalic half the rings are not very clear; each ring consists of a wide flat belt of surface, with a slightly chitinized epidermis, and a thicker hypodermis, than that in the intersegmental zone. The head is convex, rounded posteriorly, and flattened below; in front and below it projects forward as an anterior firm ridge, with a thick chitinous integument, a little under whose edge are the two pairs of hooks. The surface of the body is finely and rather irregularly ridged in some places, but is devoid of either processes or bristles. On the back of the vertex, 7 mm. from the front, there is a small, raised, flatly conical, median wart, slightly radially ridged around its margin, but imperforate; in front of this are five or six other smaller wartlike surface-eminences.

The two pairs of hooks are sharply curved, acute, hollow, the internal cavities extending to near their points; they have each an inferior basal spur, elongated anteriorly for muscular attachment; each has also a bilaminar basipodal process, to which also the muscular lamellæ are attached. These hooks are dark brown, and finely longitudinally striated in some places; each hook is about 0.6 to 0.28 mm. in length. The mouth is elongated, elliptical, with a smooth chitinous peristomial ring, on the level of the bases of the median hooks; it leads into the scarcely subdivided digestive tract.

Macalister then describes the internal organization of both sexes, and concludes with the following diagnosis:—

Pentastoma imperatoris, body with forty to forty-five rings, clearly annulated behind, more indistinctly in front; head acutely wedge-shaped, with no lateral stigmata, but with several median dorsal warts; hooks simple, with slender basal processes; vulva very close to vent; posterior end dilated pyriform, with its narrowest end terminal; stomach scarcely dilated; males slightly incurved at the tail; dimensions as above.

Leuckart (1860), under the name of *Pentastomum proboscideum*, gives a diagnosis which is mainly if not entirely based on the porocephalus of the Boas. It is as follows:—

Corpus subclavatum, retrorsum sensim attenuatum, obtusum, annulatoplicatum, plicis interdum evanescentibus. Cephalothorax bene distinctus, clavatus. frons rotundata. Annuli, quorum numerum est c. 40, stigmatum ordinibus plerumque 5-6 alternatim dispositis perforati, Hamulus validus, uncino bene incurvato, crasse acuminato munitus. Fulcrum latum, longiusculum, obtusum. Longitudo feminæ usque ad 80 mm., maris ad 36 mm. Latitudo anterior fem. 6.7 mm., maris 3 mm., post. fem. 3.5 mm., maris 2 mm. Habitat in pulmonibus boæ, crotali aliqrumque serpentum Americæ, satis frequens.

In a note on p. 105, Leuckart mentions the finding of several specimens of *Pent. proboscideum* by Hering in a *Boa constrictor*, and states that he obtained some of these specimens from Hering and found them to correspond in every particular with Diesing's *Pentastoma subcylindricum*, which he erroneously considers to be identical with that found in the Boa's lung.

Jacquart (1857) in *C. R. Soc. Biologie* (2), iv, p. 122, mentions finding some tongue-worms in the trachea and lung of a *Boa constrictor*. The parasites measured 3 to 8 cm. in length by 2 to 3 mm. across the anterior extremity. Other six pentastomes ½ to 1 cm. long by 1 to 2 mm. wide were found in the interstices of the lobules of the left kidney.

In a later paper, Jacquart (1866) mentions finding twenty-four specimens of "*Linguatula proboscidea*" in the lungs of a *Boa constrictor* that died, and was dissected at the Paris Museum. One of the parasites is delineated (plate XI, fig. 3), and shows thirty to thirty-three rings.

Stiles (1891) states that in January, 1890, he found several specimens of *Pentastomum proboscideum* in the lung, trachea, and body cavity of a recently imported *Boa constrictor*. At Leuckart's suggestion he fed a young dog, a guinea-pig, a rabbit, a dove, and some white mice with the eggs of the linguatulid. The result was as follows:—

When I examined the dog seventy days, the guinea-pig eighty-two days, and the rabbit eighty-three days after infection, I found that in all three cases the larvæ had died off at a very early stage of development. The majority of capsules, containing the small quiescent pentastomes, most of which had already begun to degenerate, were strongly impregnated with lime. Hence I presume that none of these animals are capable of becoming intermediary hosts of *P. proboscideum*. . . . In the dove the larvæ, as expected, had not developed at all. But the infection of white mice gave excellent results. One mouse died thirty-two days after infection. On opening the body cavity I noticed that the liver, the kidneys, the lungs, the peritoneum, and even the subcutaneous connective tissue, were dotted with numerous spots the size of a pin's head. On closer investigation these spots proved to be the seats of the encysted pentastomes. Contrary to the experience of others, I did not find a single pentastome cyst in the whole of the muscular system.

Some of the larvæ enclosed by the connective tissue capsule had died at a very early stage of development. This degree of development I will call "first stage." The others had attained that condition of development which (according to Leuckart) is reached by *P. denticulatum* at the end of the eighth week; this stage I will consider as the second stage. On the forty-fifth day after infection two more mice died. They likewise contained a great number of larvæ, all of which had proceeded further in their development than those of the first mouse (third stage). On June 3—*i.e.*, eighteen weeks and a half after infection—I killed my last mouse, and in it I found a great number of perfectly developed pentastome larvæ (fourth stage), some free in the thoracic cavity, others encysted in the various organs. These agreed so thoroughly with the diagnosis given by Leuckart of *P. subcylindricum* that I may now regard as certain Leuckart's assumption that *P. subcylindricum* is the early form of *P. proboscideum*. Later, through Leuckart's kindness, I was able to compare my larvæ with a specimen of *P. subcylindricum* found by Natterer in the liver of a Didelphys (= *Marmosa murina*) in order to establish their identity.

Stiles also endeavoured to infect some European snakes (the Common Snake, *Tropidonotus natrix*

and the Common Viper, *Vipera berus*) by giving them in their food the fully-developed larvæ from the mice in the hope of obtaining the intermediate stages between the full-grown larvæ and the adult forms. In both kinds of snakes he recovered later the larvæ from their body cavity and in one case they appeared to have grown in size, in the others, however, they had either not developed any further, or died.

(*To be continued.*)

NOTE ON COPRA ITCH.

By Aldo Castellani, M.D.

With a Report on the Mite causing it, by Stanley Hirst.

Notes on copra itch have already been published by me in other medical journals, but at that time the mite causing the disease remained unidentified. Now that Mr. Stanley Hirst has identified and described the parasite, I have been asked to give again a short clinical account of the condition.

For several years past I have noticed in Ceylon in people working in copra mills, a peculiar eruption which, for convenience sake, I called "copra itch." Copra, as well known, is derived from coco-nuts. The first impression on seeing a patient suffering from the condition is that he is suffering from scabies—except that no burrows or cunicula are present. The hands, arms, legs, and sometimes the whole body except the face, present fairly numerous, extremely pruriginous papules, often covered by small bloody crusts, due to scratching; papulo-pustules and pustules are also generally present. The eruption begins as a rule on the hands, and from there spreads to the arms, legs, and trunk; it never affects the face. The eruption has very little tendency to heal spontaneously, at least while the patient continues working in infected mills and handling copra.

Etiology.—In a patient suffering from eruption who came to see me one day immediately on leaving the mills, I noticed—on one of his arms—two tiny white specks moving about. I picked them out and examined them microscopically, when I saw they were acari-like parasites. On questioning the patient, he told me he had often observed minute whitish bodies moving about in copra dust. I asked him to bring me some copra dust, and he very kindly did so. This was swarming with minute white bodies, which on microscopical examination appeared to be identical with the two I had found on his body. Since then I have examined many other samples of copra containing the mite. Mr. Stanley Hirst describes it as a new variety of *Tyroglyphus longior*. (See attached report.)

The mite does not appear to bury itself in the skin; it apparently induces the dermatitis in the same manner as *Pediculoides ventricosus* (Newport) which lives in diseased cereals, and produces an eruption in persons handling such cereals; but further investigation is necessary to settle this point.

Experimental Reproduction of the Disease.—I have made repeated experiments on persons who have volunteered. By rubbing in *copra dust* containing the mite, itching frequently begins very shortly after, and twenty-four to forty-eight hours later an extremely pruriginous papuloid eruption often develops; the same result is obtained by picking the mites out of the dust, and placing them alone on the skin under a covering, such as a piece of lint kept in place by a bandage. The pustular stage did not occur, but this being due to scratching and secondary pyogenic infections, probably there was no time for it to develop, all the persons refusing to continue the experiment after the second day. A few individuals seem to be unaffected by the presence of the mite or the copra dust containing it.

Diagnosis.—As already stated, the eruption on superficial examination may be mistaken for scabies; true burrows, however, are always absent, and the two parasites are totally different.

Course and Progress.—The eruption has very little or no tendency to heal spontaneously while the patient goes on working with the infected copra. If the patient abstains from his work for some time the condition disappears spontaneously.

Treatment.—Beta-naphthol ointment (5 to 10 per cent.) is, in my experience, very useful. The mode of action of the naphthol in these cases is not quite clear; its beneficial effect cannot be solely due to its parasiticide properties because the copra acari remain for only a short time on the body, and in most cases when the ointment is applied at night the parasites are no longer on the skin of the patient. It may act as an antipruritic antiseptic agent, in this way diminishing scratching and secondary pyogenic infections; it is probable also that a little ointment may remain on the skin after the morning bath, and be repellent to the copra acarus, and in this way prevent re-infection.

Report on the Mite causing Copra Itch.

By Stanley Hirst.

(Published by permission of the Trustees of the British Museum.)

Dr. Aldo Castellani has kindly allowed me to examine his specimens of the mite which is the cause of copra itch in Ceylon. This acarus belongs to the Genus *Tyroglyphus*, and resembles *T. longior*, Gerv., exceedingly closely in structure. I think that it is a new variety of *T. longior*, and I propose the name *Castellanii* for this variety. A comparison between this new variety and the typical form of the species is given below.

The mites of the family Tyroglyphidæ chiefly feed in dried vegetable and animal substances, and are often present in great numbers in cheese, cereals, and other products. A number of instances of these tyroglyphid mites attacking human beings are known, and several species have been recorded as causing eruptions or other affections of the skin of persons attacked. (A list of these species is given in Professor Gedoelst's "Synopsis de Parasitologie," 1911, pp. 172-175.) Sometimes the

resulting effect is not very serious, and is only of a transient nature, for instance, in the case of grocers' itch, which is apparently caused by *Glycyphagus domesticus*, Gerv. The water-itch of Indian coolies on the tea plantations, which is also caused by an acarus of this family (*Rhizoglyphus parasiticus*, Dalgetty) seems, however, to be a serious complaint.

Tyroglyphus longior, Gerv., var. *Castellanii*, var. nov.

This new variety differs from the typical form in the following respect: The male of the typical form of the species has a pair of rather short hairs on the ventral surface of its body, some distance behind the anal suckers, and these two hairs are very much shorter than any of the other hairs at the hinder end of the body. In the male of the variety *Castellanii*, there is no pair of short hairs in this position, even the shortest of the hairs of the seven pairs at the posterior end of the body being comparatively long.

The following details of structure may also be useful: The hairs of the body appear smooth, unless carefully examined under a rather high power of the microscope, and then they are seen to be very slightly feathered. There is the same number of hairs on the cephalothoracic part of the body as in the typical form of *T. longior*, and they are similar in appearance, the hairs of the inner pair (of the two hinder pairs) being considerably longer than those of the outer pair. With the exception of the difference described above, the hairs on the abdominal part of the body are also similar to those of the typical form. (The hairs on the dorsal surface of the male are not shown correctly in Michael's figure of this species). Tarsi of legs apparently of much the same length as in the typical *T. longior*: the usual two little projections are present on the upper surface of the fourth tarsus of the male.

Length of male, .34 mm.; of female, .4 mm.

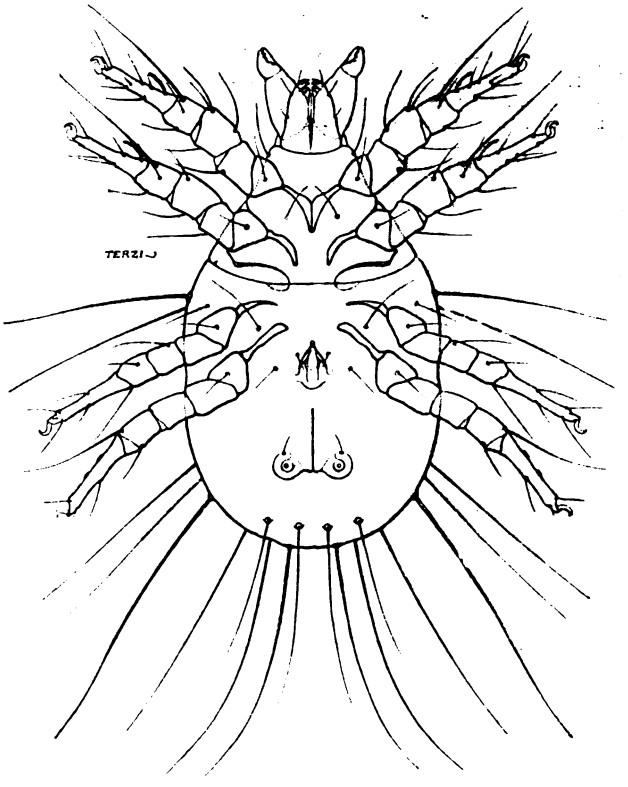

FIG. 2.—*Tyroglyphus longior*, var. *Castellanii*. Hirst. ♂. Ventral view. × 200.

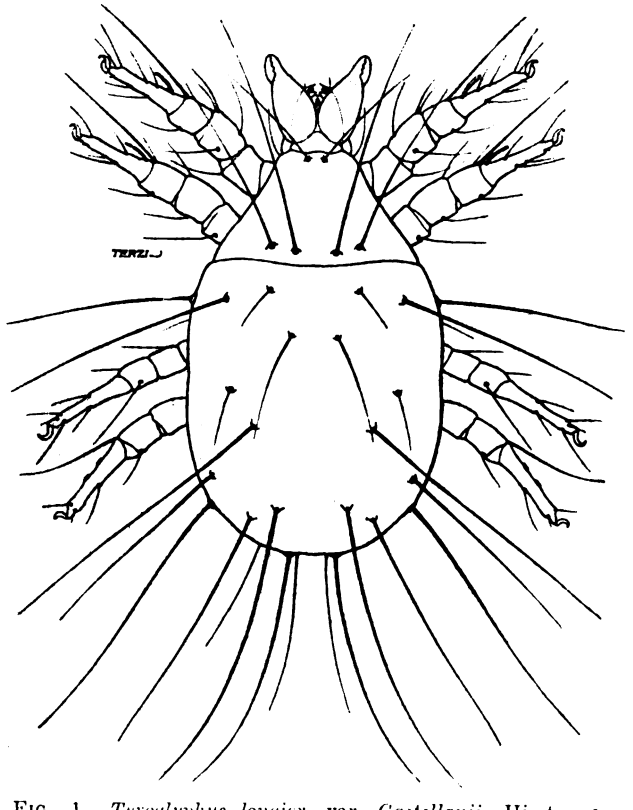

FIG. 1.—*Tyroglyphus longior*, var. *Castellanii*, Hirst. ♂. Dorsal view. × 200.

NOTE.—I have carefully compared Dr. Castellani's specimens with freshly procured examples of *T. longior* found living in Gorgonzola cheese purchased in London. The feathering of the hairs was easily seen in specimens examined alive under the microscope. According to Michael, *T. longior* has a very wide distribution in Europe, and is found on most sorts of dried or preserved animal and vegetable matter. He says that it is found in almost all houses upon dried provisions, often swarming in enormous numbers. Many other details of its habits are given in Michael's account of this species. (See "British Tyroglyphidæ," vol. 2, pp. 123-131.)

"Bulletin of Manila Medical Society."

Methylene Blue and Oxyuris.—Schultz states that methylene blue destroys the larval forms of oxyuris in the upper parts of the intestine, but has little or no distinctive effect upon the mature worms in the colon and rectum.

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THE JOURNAL OF

Tropical Medicine and Hygiene

DECEMBER 16, 1912.

MEDICAL ASPECTS OF 1912.

THE current issue of this Journal is the last to bear the date of the year 1912. The political excitement created by the introduction of the National Health Insurance Bill into the House of Commons has overshadowed all else in the sphere of medical affairs. The relation of the medical men of Great Britain to the Insurance Bill has served to bring and bind together the members of the medical profession in a fight for the honour of the profession of which they are the custodians, and in a determined struggle for even the continuance of the bare livelihood which at present is all that is possible to the majority of doctors to obtain. The temper and position of the medical profession in Great Britain will never be the same again. If the old *régime* continues a suspicious watchfulness will be maintained in case there is any further tampering with the scant privileges which are theirs; but if there is a change in the organization of the profession in regard to their relation to the State, the new order will give place to a condition of affairs which will destroy the "family doctor" legend, and produce perhaps a more efficient officer, but one in which the doctor of the old school will disappear. As the art of nursing is not confined to merely feeding and washing the patient and conscientiously carrying out the mere routine of nursing, so the prescribing of medicines or performing operations is but a part of a family doctor's life's work.

To whom are the people to turn for advice? The modern tendency to ostracize the parson and the squire, to whom they used to turn in time of distress, has tended to shut up the purse-strings of affection. The old-time schoolmaster, who was wont to advise his pupils, help them from his scanty savings to situations, and who considered it part of his duty to do so, has been "State-bound," and his efforts diverted to enforce education under penalty of a chastisement more severe than the cane wielded, or than any one of the punishments in vogue. The "family doctor" was alone left to the people, and now he is threatened to be taken thence and a State officer supplied in his place, whose duty is to the State and not primarily to the individual or the family. All this may be for efficiency; but we are passing through a phase in medical ethics the future of which no man can see. In the prevention of crime, so far as the people are concerned, there is no prophylactic body left, and the policeman is the only corrective to wrong-doing. All may be for the best, and one can only hope it is so, but the changes we are undergoing have so far increased and not lessened crime.

The scientific researches of 1912, although presenting nothing startling in the way of fresh discoveries, have nevertheless given us several useful additions to our knowledge. The subject of pellagra has, more than any other, been brought prominently before us by the work of Dr. Sambon and Dr. A. J. Chalmers in the sphere of the epidemiology of the disease and in the possibility of its being an insect-borne infection. In the United States of America pellagra has come to be regarded as somewhat approaching an epidemic, and in Great Britain a new disease has been added to those we already know. Pellagra was practically unknown in Britain until the fact was definitely proved by Drs. Sambon and Chalmers. The appearance of pellagra in a country where maize is not an, or at any rate a rare, article of food, seems to bear positive proof of the probability and possibility that Dr. Sambon's theory is the correct one, and we await further investigations with the keenest interest.

The presence of cholera in Turkey in Europe in epidemic form, even although its introduction and prevalence may be attributed to the unhygienic environment attendant upon war, cannot be neglected; and it behoves all Central European countries or those in direct communication with Turkey by sea, to be watchful that they are not caught napping in the hygienic sense.

The retirement of Sir Patrick Manson from the post of Medical Adviser to the Colonial Office and from practice is perhaps the most outstanding loss to tropical medicine. He has been the focus of "things tropical" for many years and the centre round which all questions

appertaining to tropical medicine has revolved. It is to be hoped that his example and teaching will not be lost and that his pupils may continue to maintain the high scientific standard he has set up. The Schools of Tropical Medicine in London and Liverpool continue to flourish. In the field of journalism the JOURNAL OF TROPICAL MEDICINE AND HYGIENE has had many imitators, for it must not be forgotten that it was the first journal in the world devoted to tropical medicine. The Journal is stimulated and flattered by its many imitators, and the Editors rejoice to think that there is room for all in their several spheres of usefulness.

J. C.

Annotation.

The Health of the Canal Zone.—Colonel Gorgas, in his report on the health of the Canal Zone for September, 1912, states that the total number of deaths from all causes among employees was 39, divided as follows: Disease 27, and violence 12, giving the annual average per thousand of 6.36 and 2.83, respectively.

Among employees for the month of September of each year the annual average death-rate per thousand was as follows:—

1904, 14.31; 1905, 32.00; 1906, 57.34; 1907, 28.63; 1908, 12.78; 1909, 12.76; 1910, 11.47; 1911, 14.43; 1912, 9.19.

The annual average death-rate per thousand in the cities of Panama and Colon and the Canal Zone, including both employees and civil population, for the month of September of each year was as follows:—

1905, 52.31; 1906, 54.54; 1907, 32.93; 1908, 24.91; 1909, 19.01; 1910, 21.60; 1911, 21.56; 1912, 22.42.

In segregating according to race, the annual average death-rate per thousand from disease among employees was: For whites 4.92, and for blacks 6.81, giving a general average for disease of 6.36. For the same month during 1910 the annual average death-rate per thousand from disease among whites was 3.58, and blacks 9.46, giving a general average of 7.89; and in 1911 from disease among whites 5.95, and blacks 12.24, giving a general average of 10.63.

Among employees during the month deaths from the principal diseases were as follows: Dysentery, bacillary, 1; malarial fever, æstivo-autumnal, 2; lobar pneumonia, 2; tuberculosis, 8; leaving 14 deaths from all other diseases, and 12 deaths from external violence.

No cases of yellow fever, small-pox, or plague originated on or were brought to the Isthmus during the month.

Abstract.

THE ETIOLOGY OF BLACKWATER FEVER.*

The author recently found certain curious bodies in the blood of cases of this disease which he has described and demonstrated. These bodies naturally led him to search the literature upon the etiology of the disease, and this made him realize how very far we are from any general agreement on this point, the foundation of the proper treatment and prevention of the malady. While far from asserting that the bodies in question are etiologically connected with blackwater fever, such indeed would be a most unwarrantable suggestion at the present moment, they have led him to formulate yet one more hypothesis as to its causation which he was anxious to submit for consideration and criticism.

In the first place he proposed to make a brief review of the various hypotheses and observations connected with the etiology of blackwater, with a view to arriving at an understanding of the points or factors which might be taken as established, and upon which there was practically universal agreement. In the second part of the paper are described the bodies the author encountered, and the hypothesis to which he had alluded, and endeavour is made to illustrate how far this hypothesis is consistent with the known facts.

I.

Acute differences of opinion from time to time have made themselves apparent in connection with the etiology of blackwater fever. One has not to read far before one encounters records and observations apparently altogether opposed to what, up to that moment, one had supposed to be an established fact. Going further, one finds what appears to be a reasonable explanation of these contradictions or a reconcilement of opposing views, only to find one's faith once again overturned by the reading of the next article. At the same time there is fairly general agreement upon certain points, and it is those which the author was anxious to arrive at, for no hypothesis can be entertained seriously if it is inconsistent with the observed facts.

Lying at the outset of the question one point appeared very clear, namely, that in many instances true blackwater fever has been confused with some other form of hæmoglobinuria, and herein is undoubtedly one of the causes of contradictions and discrepancies. One comes across records of cases in which the only symptom suggestive of the disease was the presence of hæmoglobin in the urine. It is a familiar fact that this may occur in a number of other diseases, from the taking of various drugs, from fatigue, exposure, &c. Paroxysmal hæmoglobinuria has a very obscure pathology, and, should it occur in an endemic area of blackwater, or in an individual whom we might suspect to be liable to this, confusion and error of diagnosis must be very possible. At all

* A paper read at the Society of Tropical Medicine and Hygiene, October, 1912, by Sir William Leishman, F.R.S.

events the recorded symptoms in many cases do not in all features correspond to the classical clinical picture. It is also very difficult to contrast with one another cases described at different times and from different localities, and the most valuable records are those of such as have had the opportunity of observing a considerable number of cases in the same locality or, preferably, in a hospital, and this over a considerable time. Odd cases here and there, observed often under the most trying conditions for accurate inquiry, are apt to lead to hasty and unjustified generalizations. In attempting to review the literature of the published cases, this uncertainty crops up frequently, and is one of the causes of the divergence of opinion on the etiology of this disease.

A mere outline is given of the alternative views current at this time, and the main factors telling, respectively, for and against these.

It is convenient to follow the classification commonly adopted, in which all hypotheses are grouped under one of the following four heads:—

(1) That it is a manifestation of active malaria.

(2) That it is quinine poisoning.

(3) That it is due to a specific organism.

(4) That it is a result of a condition brought about by previous malarial infection.

(1) The first of these, that blackwater fever is simply a form of malaria, is little advocated to-day. It is abundantly clear, that, whatever influence previous malaria may have, it alone cannot be held responsible for the syndrome of symptoms constituting hæmoglobinuric fever. It is undoubted that cases have occurred in which no evidence of malaria could be detected either before, during, or after the paroxysm, and, although parasites may be found in a very large majority of the cases, particularly on the day before the attack, there is no direct relationship between their numbers and the severity of the subsequent attack of blackwater. The theory that blackwater fever may be due to the malignant tertian parasite alone has been disproved, since it has been found, though rarely, associated with both quartan and benign tertian, and there is little in support of the conjecture that it may be the result of a sudden increase in the virulence of the parasite. At the same time, many are agreed than an attack of malaria may act occasionally as an exciting cause of the disease. One of the strongest points against the disease being actually a manifestation of, and due to, the malarial parasite, is the fact that an attack is altogether uninfluenced by quinine.

(2) Quinine poisoning, as the essential cause of blackwater fever, is still a matter of debate. This question is especially complicated by the well-known fact that the administration of this drug, in the case of individuals who have at some time suffered from malaria, may be followed by an attack of hæmoglobinuria. The recorded cases of this nature were too numerous, and too well attested to admit of any doubt that this is the case, but the author fancied there were few now who would go so far as to say that quinine poisoning was the sole cause of the disease. The problem is a very involved one; on the one hand, we have records of cases, described by Sir Patrick Manson and others, where an attack of hæmoglobinuria could be produced at will by the ingestion of even a small dose of quinine, and the records of cases, such as Ketchen's, where a series of seven consecutive attacks in the same individual were each the sequel of a dose of quinine. On the other hand, against its being due to quinine alone, there are such strong points as the following, all well established: (i) No cases have been recorded in non-malarious countries in which quinine, given for some other disease, has caused blackwater fever. (ii) Numerous well-authenticated cases are on record in which blackwater fever developed in individuals who had either never had quinine at all, or who had had none for a considerable time before the attack. (iii) A man may have an attack of blackwater fever subsequent to a dose of quinine, and yet may afterwards take even large doses of the drug with impunity. (iv) There appears to be no relation between the size of the dose, the channel of administration or the particular salt employed, and the attack, although each of these has at times been suggested as the essential factor.

The conclusion is that we must admit that quinine, though almost indubitably not the sole cause of the disease, may be, and frequently is, one of the exciting causes of an attack. There are many points requiring consideration, such as the question of personal idiosyncrasy to quinine, and the bearing of the cessation or great diminution of the excretion of quinine in the urine during the attack on the causation of the hæmoglobinuria.

As to the mechanism by which the drug is supposed to cause the hæmoglobinuria, most hold that it acts directly on the malarial parasites, and that these when destroyed liberate a toxin with hæmolytic powers for the red cells. Few even of the strongest supporters of the quinine hypothesis do not admit, however, that some other factor is required to explain all the facts.

(3) As to the third view, namely, that the disease is caused by a specific virus, a possibility that few even of the strongest advocates of the alternative hypotheses deny, there is at present no proof. There has been a general feeling that if such a specific organism were found it would satisfactorily clear up many of the points which remain mysterious in connection with the disease, but, in view of the persistent failure to establish the claims of such parasites as have been described, this hypothesis has been almost abandoned. On the analogy of diseases of animals due to piroplasmata, so often associated with hæmoglobinuria, a similar organism has been suggested by Sambon and others in blackwater fever, but the most careful search has failed to reveal, or at least to confirm, anything of this nature. In fact, in view of the enormous amount of painstaking blood investigation by the most skilled hands and eyes, it may be taken as proven that no special intra-corpuscular parasite of the red cells exists in this disease. The suggestion that a new species or an exceptionally virulent species of malaria may be the cause has not been established, and there are

many facts telling against such a supposition. Whether the fuchsin-staining spirochæte of Anthony, whose cultures were supposed to have reproduced the disease on inoculation into animals, has been seen by anyone else the author could not discover.

One of the arguments most frequently urged against there being a specific virus, apart from the fact that none has yet been seen, is the fact that the disease only rarely attacks new comers to an endemic area. This argument, however, appears of doubtful cogency; so many other things come into play besides the mere duration of residence, and, moreover, although it is admitted that the general statement is correct, there are on record a number of instances in which new comers have been attacked, one even within ten days of his first arrival in the endemic zone, while there are quite a number which occurred within six months of arrival.

Altogether, it may be said that although there is little beyond conjecture in support of the disease being one, *sui generis*, there are many indications that a properly accredited virus would not be unwelcome to many of those who have wide knowledge of the disease, and who are not altogether satisfied with any of the current explanations.

(4) The view which is most widely current is that blackwater fever, although not actually a manifestation of malaria, is a condition brought about by previous malarial infection. If there is one point upon which everyone is agreed in this most puzzling of diseases, it is that there is a close and constant association with malaria. Although cases are on record in which it is stated that there was no evidence of antecedent malaria yet such cases have always occurred in endemic malarious countries, and the author knew of none reported in individuals who had never resided in such a country or district. It is necessary to keep clearly in one's mind the distinction between this proven or possible malarious infection prior to the attack of hæmoglobinuric fever, and the actual demonstration of parasites in the blood at the time of, or immediately preceding, the paroxysm. As already mentioned, the latter is certainly not an absolutely essential preliminary, but the former, with equal or greater certainty, may be said to be indispensable. This appeared to the author so clear that he did not think any hypothesis of etiology which failed to take this fact into account could hold for a minute.

There are apparent discrepancies between the geographical distribution of blackwater fever and malaria, on which much has been said and written; it appears certain that earlier objections to any close relationship between the two can no longer be upheld since recent researches have, in so many instances, shown that blackwater fever is present, though perhaps rare in countries hitherto believed to be free from it. Admitting this freely, however, there still remain instances of districts or countries, in which, though malaria is present in intense and widespread form, yet cases of blackwater have not yet been observed. It does not suffice, as has been done, to comment on such cases that it must have been present, but has been unrecognized by the local physicians; criticisms of that sort are easy to make, but are neither generous nor justifiable. Few will question the statement that discrepancies still remain unaccounted for in the geographical distributions of malaria and black water fever.

No better exposition of the hypothesis of the necessity of antecedent malaria can exist than is to be found in the admirable work of Deeks and James in which they record the results of their observation of 230 cases of hæmoglobinuric fever in the Canal Zone of Panama.—The conclusions which they reached as the result of their painstaking observations were as follows:

(1) Hæmoglobinuric fever is a manifestation of malarial toxicity, for the most part brought about by repeated attacks of malaria.

(2) It may appear coincidently with an acute malarial paroxysm.

(3) It may be determined by any depressing influence.

(4) It may be induced by the administration of quinine.

(5) Quinine alone, or malarial infection alone, do not cause hæmoglobinuria, but one or both of these conditions, plus the toxin eventuated during the course of one or more malarial attacks.

In another part of their work they add that, in their opinion, blackwater fever invariably manifests itself when certain conditions relative to the epidemiology of malaria, and to that of no other disease, are present. These conditions are:—

(1) The presence of a population non-immune to malaria.

(2) The prevalence of malaria in such quantity as to produce an almost continuous infection of this population.

(3) A large proportion of æstivo-autumnal malaria; because the amount of blackwater fever is in direct proportion to the intensity of this variety.

(4) The neglect of prompt and continuous administration of quinine, especially in primary attacks, to persons non-immune against malaria.

They assert that in every locality, without exception, where these conditions obtain, hæmoglobinuric fever is found.

It appears, then, that it may be taken as certain that previous malaria, or, to put it in another form, exposure to the conditions which induce malaria, is a necessary antecedent to true blackwater fever. It is, however, as generally granted that, in addition to this predisposing cause, there is further required a determining or exciting cause. No lack of these exciting causes have been reported and suggested, and in almost all the evidence is so clear that one is bound to accept them as having an important, albeit secondary, *rôle* in the etiology of the disease. As has already been said, an actual attack of malaria itself may be such an exciting cause, while quinine is so commonly recorded that it has been promoted by some to the rank of a primary cause; be that as it may, there is at least no doubt of the fact that, in certain individuals it acts as the exciting or

determining cause. Exposure to cold, damp, fatigue or over-exertion, change of residence, for instance from the interior of an endemic country to the coast, or return from the tropical to the home country, have often been reported as the apparent exciting cause of an attack, which, at all events, has not infrequently coincided with such movements.

Of the rarer secondary or exciting causes which have been mentioned there are, without attempting to give an exhaustive list, the following: Alcoholism, syphilis, gonorrhœa, association with the rheumatic diathesis, diminished alkalinity of the blood, kala-azar, a meat diet, mental states and emotions, the existence of a kidney lesion, the ingestion of special articles of diet, such as beans, figs, snails, and absinthe, and even the smell of certain substances. There is a very long list of drugs which are known to be capable at times of causing hæmoglobinuria, apart altogether from antecedent malaria or residence in an intensely malarious country, and one must realize that it is inevitable that a certain number of cases of hæmoglobinuria occurring in the Tropics must have been caused by drugs, and it can hardly be doubted that some have been diagnosed as blackwater fever.

The above list affords abundant opportunity for a critical consideration of the evidence connecting each with the disease under discussion, but, such an analysis would not appear to serve any very useful purpose. Again one may generalize in the statement that the paroxysm of hæmoglobinuric fever is usually called forth by the action of some secondary or exciting cause, and that the most common of such causes appear to be exposure to cold and the exhibition of quinine.

Within recent years a large amount of experiment and research has been directed to the elucidation of the actual mechanism of the hæmolysis which takes place on so colossal a scale and with such great suddenness. In view of the close connection with antecedent malaria much of this work has been directed towards the elaboration of some theory which would satisfactorily explain the appearance in the blood of a specific malarial hæmolysin. It cannot be said that any of the theories put forward are very convincing; the larger part of them assume that the antigen which calls forth these specific antibodies is a toxin liberated from the malarial parasites, when these are suddenly destroyed, for instance by the action of a dose of quinine. Others assume that as the specific hæmolysis is formed, by repeated attacks of malaria, an anti-hæmolysin also makes its appearance, and that these exist in the blood side by side until some agency, such as one of the exciting causes mentioned above, comes into action and disturbs the equilibrium between them, thus permitting the hæmolysin to act suddenly upon a large number of cells. The correct interpretation of the hæmolytic phenomena appears to me to bristle with difficulties and, ingenious as are many of the theories—notably the one of Christophers and Bentley, who bring evidence to show that the hæmolysin is probably derived as a result of auto-immunization against the individual's own red cells, which are constantly being phagocyted in the spleen and elsewhere—it cannot be said that any of them find universal acceptance. Barrett and Yorke have shown that quinine cannot be held responsible *per se*, since it would have to be present in the blood in toxic dose before it could produce hæmolysis; they believe that the hæmoglobinuria is the result of an antecedent hæmoglobinæmia and that the anuria is due to mechanical blocking of the urinary tubules.

It appears of doubtful value to attempt to apply to these little understood processes of protozoal immunity the doctrines of bacterial immunity in terms of Ehrlich's hypothesis; it is, the author thinks, still far from clear that protozoal immunity, when it exists, follows the same lines as bacterial immunity, at all events there is little satisfactory evidence in such diseases of the appearance of such substances as lysins, agglutinins, precipitins, opsonins, &c. A recent history of Cleland's that in the phenomenon of hæmolysis we have an expression of an anaphylactic condition, brought about by the presence in the serum of a foreign protein in the shape of disintegrated merozoites, though ingenious, will hardly bear close inspection.

The author concludes this short review of our present knowledge of the etiology of blackwater fever by summarizing a few of the principal conclusions to which his study had led him and which appeared to be accepted fairly generally.

(1) Blackwater fever is only encountered in those who have either suffered from malaria or who have lived for some time in a country in which they must constantly have been exposed to the danger of malarial infection.

(2) One attack of blackwater fever confers no immunity against further attacks, but negro and other native races inhabiting endemic zones exhibit a certain degree of immunity. Whites and alien natives introduced into an endemic zone are most liable to the disease, but, as a rule, only after a certain period of residence.

(3) Immunity to malaria appears to go hand in hand with immunity to blackwater fever, and measures which protect against malarial infection are also prophylactic against blackwater fever.

(4) The regions of most intense malarial infection are those in which blackwater fever occurs, but there exist also extremely malarious regions in which it is either extremely rare or absent.

(5) In the majority of cases an exciting cause is needed to produce the hæmoglobinuric fever; the most frequent appear to be quinine and exposure to cold.

(6) The precise mechanism of the sudden and extensive hæmolysis is not yet fully understood; there is certainly no direct relationship to the number or severity of the antecedent attacks of malaria, or to the number of malarial parasites present at the time of the attack.

(*To be continued.*)

Notes and News.

THE SECOND ALL-INDIA SANITARY CONFERENCE AT MADRAS.

THE second All-India Sanitary Conference opened its session at the Council Chamber, Fort St. George, at 10.30 a.m., on November 11, 1912. The Honourable Sir Harcourt Butler, K.C.S.I., C.I.E., I.C.S., Member of Viceregal Council, Calcutta, presided, and the following delegates were present:—

India.—The Honourable Mr. L. C. Porter, C.I.E., I.C.S., Secretary to the Government of India, Department of Education; the Honourable Surgeon-General Sir Charles Pardey Lukis, K.C.S.I., M.D., F.R.C.S., I.M.S., Director-General, Indian Medical Service; Major J. C. Robertson, M.B., D.Ph., I.M.S., Sanitary Commissioner with the Government of India; Kunwar Maharaj Singh, M.A., Barrister-at-Law, Assistant Secretary to the Government of India, Department of Education; Major F. W. Harvey, M.B., D.Ph., I.M.S., Officiating Director, Central Research Institute, Kasauli; Captain A. G. McKendrick, M.B., I.M.S., Officiating Secretary to the Director-General, Indian Medical Service (Sanitary); Major E. D. W. Greig, M.D., D.Sc., I.M.S., Officer on special duty in connection with the investigation of cholera; Captain F. P. Mackie, M.B., F.R.C.S., I.M.S., Officer on special duty in connection with the investigation of *Kala-azar;* Dr. V. T. Korke, Officer on special duty in connection with the investigation of *Kala-azar.*

Madras.—The Honourable Surgeon-General W. B. Bannerman, C.S.I., M.D., D.Sc., I.M.S., Surgeon-General with the Government of Madras (Vice-President for Section A); Captain W. A. Justice, M.D., D.Ph., I.M.S., Sanitary Commissioner for Madras (Secretary to Section A); Mr. W. Hutton, A.M.I.C.E., Sanitary Engineer, Madras (Vice-President for Section B); Dr. F. Maitland Gibson, M.B., B.Sc., Director of the King Institute, Guindy; Captain W. S. Patton, M.B., I.M.S., Officer on special duty in connection with the investigation of *Kala-azar;* Captain F. W. Cragg, M.D., I.M.S., Officiating Assistant-Director, King Institute, Guindy; Mr. J. M. Lacey, B.C.E., A.M.I.C.E., the Public Works Department, Madras; Dr. W. R. MacDonald, M.B., Ch.B., D.P.H., Health Officer, Corporation of Madras; M. J. W. Madeley, Special Engineer, Corporation of Madras; Mr. E. P. Richards, M.I.C.E., City Engineer, Madras; Dr. P. S. Chandra Sekhar, B.A., M.D., Assistant Professor of Hygiene and Bacteriology, Medical College, Madras; Lieut.-Col. C. Donovan, B.A., M.D., B.C.H., B.A.O., F.L.S., F.R.S., I.M.S., Surgeon, Fourth District, Madras; Captain O. A. R. Barkely Hill, M.D., I.M.S., Officiating Deputy Sanitary Commissioner, Madras, and Dr. T. M. Nair, of Madras.

Bombay.—Honourable Mr. G. Curtis, Commissioner of Central Division; the Honourable Mr. J. P. Orr, C.S.I., I.C.S., Chairman, City of Bombay Improvement Trust; Mr. E. G. Turner, I.C.S., Officer on special duty in connection with the development of Salsette; Major H. A. Forbes Knapton, I.M.S., Officiating Sanitary Commissioner, Bombay; Mr. Narjundayya Belvadi, B.A., L.C.S., Sanitary Engineer, Bombay; Mr. C. N. Mundy, Executive Engineer, Poona drainage and water-supply; Major F. H. G. Hutchinson, M.B., C.M., D.Ph., I.M.S., Officer on special duty in connection with the Experimental Sewage Installation in Poona; Major W. G. Liston, M.D., D.Ph., I.M.S., Director, Bombay Bacteriological Laboratory; Dr. J. A. Turner, M.D., D.Ph., Executive Health Officer, Bombay Municipality; and Dr. Dinsha Bomanji Master, I.M. and S. of Bombay.

Bengal. — Major Leonard Rogers, C.I.E., M.D., F.R.C.P., F.R.C.S., I.M.S., Professor of Pathology, Medical College, Calcutta, and Bacteriologist to the Government of Bengal; Major W. W. Clemesha, M.D., D.P.H., I.M.S., Sanitary Commissioner, Bengal; Dr. C. A. Bentley, M.B., D.Ph., Special Deputy Sanitary Commissioner for Malaria Research in Bengal; Mr. G. B. Williams, Sanitary Engineer, Bengal; Mr. A. J. G. Maflin, Assistant Sanitary Engineer, Bengal; Rai Kailas Chandra Bose Bahadur, C.I.E., of Calcutta; Bebu Bepin Behari Brahmachari, L.M. and S., Health Officer, Cessipur-Chitpur Municipality; and Mr. Motilal Ghosh, Editor of the *Amrita Bazaar Patrika*, Calcutta.

United Provinces.—Major S. A. Harris, M.B., C.M., D.T.M. and H., I.M.S., Sanitary Commissioner, United Provinces; the Honourable Rai Ganga Prasad Varma Bahadur, of Lucknow; Major J. D. Graham, M.B., D.T.M., I.M.S., Special officer on malaria duty in the United Provinces; Mr. A. W. E. Standley, Officiating Superintending Engineer, II Circle, Irrigation Works, United Provinces; Captain H. Ross, M.B., I.M.S., Chief Plague Officer, United Provinces; Captain C. L. Dunn, I.M.S., Deputy Sanitary Commissioner, United Provinces; and Mr. C. H. West, Sanitary Engineer, United Provinces.

Punjab. — Lieutenant-Colonel E. Wilkinson, F.R.C.S., D.P.H., I.M.S., Sanitary Commissioner, Punjab; the Honourable Khan Bahadur Syed Mahdi Shah, of Gojra; Lieutenant-Colonel S. Browning Smith, I.M.S., Chief Plague Medical Officer, Punjab; Dr. A. G. Newell, M.D., D.Ph., Health Officer, Lahore; Mr. A. S. Montgomery, Sanitary Engineer, Punjab; and Mr. T. Miller Brownlie, Municipal Engineer, Amritsar.

Burma.—Major C. E. Williams, M.A., M.D., B.C., D.Ph., D.T.M., I.M.S., Sanitary Commissioner, Burma; Major N. P. O'Gorman Lalor, M.B., B.Ch., B.A.O., D.Ph., I.M.S., Deputy Sanitary Commissioner, Burma; Dr. J. B. Stephens, M.R.C.S., L.R.C.P., D.Ph., Municipal Health Officer, Rangoon; and Mr. E. Gabbett, V.D., M.I.C.E., M.R.S.I., Sanitary Engineer, Burma.

Bihar and Orissa.—Captain W. C. Ross, M.D.,

D.Ph., F.C.S., I.M.S., Officiating Sanitary Commissioner, Bihar and Orissa; Mr. G. W. Disney, Sanitary Engineer, Bihar and Orissa; and Moulvi Sayed Zahir-ud-din, Vice-Chairman, District Board of Patna.

Central Provinces.—Major T. G. N. Stokes, B.A., M.B., B.C.H., B.A.O., L.M., D.T.M. and H., I.M.S., Sanitary Commissioner, Central Provinces; Major L. W. S. Oldham, R.E., A.M.I.C.E., Sanitary Engineer, Central Provinces; and Khan Bahadur Manekji Merwanji Mullah, of Balakhat.

Assam.—Captain T. C. McCombie Young, M.B., D.P.H., I.M.S., Deputy Sanitary Commissioner, Assam; Rai Sahib Dandadhar Barna, of Golaghat, Sibsagar; and Dr. Valentine, Medical Officer, Tea Gardens, Assam.

Ceylon.—Dr. G. J. Rutherford, M.R.C.S., L.R.C.P., Assistant Principal Civil Medical Officer, Ceylon; Dr. W. Marshall Phillip, M.B., Municipal Medical Officer of Health, Colombo; Mr. C. L. Cox, Sanitary Engineer, Colombo Municipality.

Mysore.—Mr. V. Rangasawmy Iyengar, Superintending Engineer of the Southern Circle, Mysore State; and Dr. Amritaraj, L.R.C.P. and S., D.Ph., Health Officer, Civil and Military Station, Bangalore.

Hyderabad.—Mr. V. Devasikamani Pillai, Sanitary Engineer, Hyderabad.

The President's Speech.

Sir Harcourt Butler addressed the delegates as follows: Gentlemen,—In welcoming you to our second All-India Sanitary Conference, I desire, on behalf of the Government of India, to thank the Government of Madras for the arrangements which they have made for us, and the various Local Governments and Administrations, and yourselves for your presence here. The experience of the past twelve months has, I think, demonstrated the utility of conferences of this kind. Ideas and interests have been quickened on all sides and there are signs of a sanitary awaking in India, of the dawning of an age of greater attention to public health. Not the least hopeful sign is the number of applications which have been received from professional men and members of the general public for permission to attend our meetings. Many of these we should have liked, but have for reasons of space, been unable to grant. Our body is already large. I hope that it is thoroughly representative. We specially welcome the presence of non-official representatives of the different provinces as an augury of that co-operation between experts and laymen without which, as I pointed out last year, it will be difficult, if not impossible, to achieve any widespread sanitary progress in this country. You will observe certain changes in our procedure this year. In view of the number of papers submitted for consideration, and the importance of the subjects dealt with, it has been decided to extend the Conference from two to six days, and to divide it into two sections, medical and engineering, so as to enable both research workers and practical sanitarians to derive the fullest benefit from the discussions on their respective subjects, without unduly prolonging the session.

Since we last met, two important administrative measures have received the sanction of the Secretary of State, namely, the revival of the appointment of Sanitary Commissioner with the Government of India, and the introduction of a scheme for the reorganization of the Sanitary Services. Certain changes have been made in the duties of the Sanitary Commissioner. Experience has shown, on the one hand, that his usefulness depends largely on his touring freely, and, on the other hand, that bacteriological and research work cannot be divorced from the practical side of medicine, without great waste of power and opportunity. It has been arranged, therefore, to relieve him of much of the office work that has hitherto tied him to headquarters, by amalgamating the office establishments of the Sanitary Commissioner and the Director-General, Indian Medical Service, and to hand over bacteriological and research work to the latter officer. The Sanitary Commissioner, however, remains the final authority on all technical sanitary matters, and as such has power as formerly to correspond direct with the Government of India. These arrangements will secure a high measure of practical efficiency, and I take this opportunity to observe that we are indeed fortunate in starting them with officers so able, zealous, and tactful as Surgeon-General Sir Pardey Lukis and Major Robertson.

The scheme for the reorganization of the Sanitary Services, to which I referred in my speech last year, continues a progressive policy of decentralization by giving to Local Governments power to select their own Sanitary Commissioners under certain conditions. It also provides for the creation of eight additional appointments of Deputy Sanitary Commissioner, two each for Madras and the United Provinces, and four for the reconstituted Provinces of Bengal and Bihar and Orissa. These appointments will no longer be reserved for Officers of the Indian Medical Service, and Indians possessing the necessary qualifications will be eligible for them. Provision is also made for the appointment of Health Officers of the first class for larger municipalities, and of the second class for smaller towns. Officers of the first class will, for the present, be required to possess a British diploma in Public Health, but this condition will be removed as soon as arrangements can be made in India for the necessary training. It is hoped that a post-graduate class for the D.P.H. of the Calcutta University will shortly be opened in connection with the recently sanctioned School of Tropical Medicine at Calcutta. In order to assist Local Governments to establish this trained service, the Government of India have offered to grant an annual subsidy to those Governments which cannot find the money from provincial funds, to the extent

of the entire cost of the additional Deputy Sanitary Commissioners, and half the cost of the Municipal Health Officers. It is hoped that Local Governments will then be able to help municipal bodies in the organization of a service of trained Sanitary Inspectors on a system similar to that in force in Madras, and in the improvement of the subordinate staff of the conservancy establishments. In these ways the foundations are being laid of a modern and up-to-date organization which will expand in response to the demands that will be made upon it.

Under the auspices of the recently constituted research fund, an exhaustive inquiry into various problems connected with cholera and kala-azar has been conducted by selected medical officers, and several interesting and important discoveries have been made and will be communicated to you in the course of the Conference. Also a number of medical officers and subordinates, after a careful training under Professor Howlett, at Pusa, have been detailed for carrying out stegomyia surveys in all our chief ports, with a view to the destruction or reduction to non-dangerous numbers of this mosquito, which is known to be the carrier of yellow fever. Major James, who was deputed to Panama to study that disease in its endemic area, is expected back in India at the end of this month, and he will be able to give us the benefit of his special and fresh experience in our preventive campaign against yellow fever, before he proceeds on deputation to Ceylon for a period of one year under the Ceylon Government. It is proposed, on the completion of the kala-azar and cholera inquiries, to take up the investigation of relapsing fever, elephantiasis, dysentery, and the various types of pneumonia, in connection with all of which many obscure points require elucidation.

Anti-malarial measures.—I now come to the disposal of the grant of Rs. 5 lakhs for anti-malarial measures. This sum is primarily intended for the execution of worked out anti-malarial projects. These may have reached one or other of two distinct and separate stages:—

(i) Initial and detailed local inquiries into the conditions causing the malaria; and

(ii) The practical application of this knowledge towards ameliorating or removing these conditions.

Grants-in-aid will in future be allotted only to schemes which have reached the second stage. During the current year grants have been given to projects which are still in the first stage, and the following sums have been disbursed:—

Madras, for malarial enquiry in Ennore, Rs. 28,000; Bombay, malarial investigations in Sind and the Kanara district, Rs. 21,380; Anti-malarial measures in Bombay City, Rs. 50,000; Bengal, experimental jungle clearing, Rs. 50,000; United Provinces, anti-malarial schemes in Saharanpur, Nagina and Kosi, Rs. 1,80,000.

In Bombay and the United Provinces alone was any big scheme ready. In other Provinces several projects are now under consideration. These experiments will, it is hoped, result in much valuable knowledge for the benefit of the peoples of India.

Town Planning.—Turning now to the agenda, perhaps the most important items are town planning and the opening up of congested areas—subjects, I may say, very near to the heart of the Secretary of my department, Mr. Ludovic Porter, whose enthusiasm and ability I desire heartily to acknowledge. The evils of overcrowding and defective ventilation which exist in all great cities are intimately connected with high death-rates, and especially with the spread of tuberculosis. The Government of India have recently addressed Local Governments on the subject of the formation of anti-tuberculosis societies, but no societies of the kind and no preventive measures will check the ravages of this terrible scourge, unless effective measures are taken to improve the housing of the masses, to open out existing insanitary areas, and to insure that all future town expansions are planned on scientific lines. These questions are fully treated in the important papers for discussion to-day on town planning by Mr. Turner, and on light and air in dwellings in Bombay by Mr. Orr. We are particularly grateful to these officers for attending the Conference, for they can speak with a knowledge and experience which few in India possess; indeed, they may be called pioneers in India of the new science of town planning. You will not expect me to offer any remarks on the various scientific and technical papers which will be read before the different sections, but I wish to draw special attention to the important discussion on rural and urban water supplies which will occupy the afternoon of the second day, and to the paper on travelling dispensaries in the United Provinces, which will be read by Captain H. Ross. I confess that I can conceive no object more humane, no measure better calculated to brighten the lives of the people and reduce the mass of human suffering than the provision of a pure and sufficient water supply, where such does not exist. We are informed that travelling dispensaries have proved a great boon, not only in bringing medical and surgical relief within reach of the rural population, but also in winning the confidence of the people.

Education and Sanitation.—It is no accident or idle chance that education and sanitation are united under the same department of the Government of India. Our first and signal objective is to educate the people as to the value and necessity of measures for protecting them in their homes and their lives, and those dearest to them from the ravages of plague, malaria, cholera, and other communicable diseases, and all the miseries which follow in their train. "Day and night," wrote Hesiod long ago, "diseases run to and fro amongst men at their will," *Autŏmatoi phiŏtosi!* That was the old idea. That is still the idea of the vast majority in India to-day. We are here to preach another doctrine, to enforce another view. We believe, and we have proofs of our belief, that the courses of disease, though mysterious, are not

capricious but defined by conditions which are ascertainable. In this faith we are building up a school of research in India, which will soon rank with the first in the world. Fortified by the results of research we can leave the future, with confidence, to preventive medicine and preventive sanitation, but we must have the people with us, or we can do but little. In recent years, by precept and example, the Governments in India have done much to penetrate the mists of ignorance and prejudice which hide from the masses the blessings of sanitary science, the science of new and better and happier conditions of society. In the last two years the Imperial Government has made grants for sanitation aggregating more than a million sterling, and in its anxious solicitude for the health and comfort of the people that Government has also recently decided to institute, in concert with Local Governments, a comprehensive enquiry into the possibility of improving sanitary arrangements along pilgrim routes and at pilgrim centres. This philanthropic energy has not been in vain. The demands upon us are growing apace. In increasing numbers people want things done, and when men want things done they must, in these days, turn to experts to show the way. You, I know, will not fail, gentlemen, when the call for the expert resounds throughout this ancient land; and, meanwhile, you will push forward the work to which you have laid your hands with dauntless patience and indefatigable zeal.

Notice.

THE SOCIETY OF TROPICAL MEDICINE AND HYGIENE.

THE following papers will be read at the December meeting of the Society of Tropical Medicine and Hygiene to be held at 11, Chandos Street, on the 20th inst.:—

(1) "Vaccination with Live Vaccines (Attenuated) in Typhoid, Paratyphoid and Cholera."

(2) "Brief Remarks on Various Fungi producing Disease in the Tropics, with a Demonstration of Cultures."

Both of these will be given by Dr. A. Castellani, Director of the Government Clinic for Tropical Diseases, Colombo, Ceylon.

Correspondence.

To the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

DEAR SIRS,—In the JOURNAL OF TROPICAL MEDICINE AND HYGIENE of August 15, 1912, is the report of the Medical Department, Seychelles.

It is there mentioned that phthisis is a serious disease, and it is said "I think it advisable that the people should be warned of the danger of drinking milk from tubercular cows."

In the returns of the Victoria Hospital, Seychelles, there are no cases of tubercle given of any kind. The fact that there is no phthisis pulmonalis may be due to cases not going to hospital for that disease, but I think that the fact that there are none of the other localized tuberculoses points to their non-existence in the islands.

If there are none of these localized tuberculoses I think it will be found that there are no tubercular cattle. There are none in the Malay Peninsula, and in fifteen years I have not seen a case of lupus, or of tubercle of bone or joints; and it would be of value to know if there are tubercular cattle in other tropical places, and if the absence of localized tuberculoses is coincident with the absence of tubercular cattle.

In my opinion the tubercle question in the Tropics is one of human infection only, and therefore a far simpler one than it is in temperate climates.

I am, yours faithfully,

J. TERTIUS CLARK.

Perak, F.M.S.,
November 6, 1912.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"Bulletin of Entomological Research," November, 1912.

Entomology.—The *Bulletin of Entomological Research* for November, 1912 (vol. iii, part 3, pp. 227-348), contains the following original communications: "New African Tabanidæ," part 2, by Ernest E. Austen; "A Key for determining the African Species of *Anopheles* (*sensu lato*) (illustrated)," by F. W. Edwards; "Notes on Tsetse-flies and on Prophylactic Measures against Sleeping Sickness in the Western Province of Ashanti," by T. E. Fell; "On the Utilization of an Indigenous African Silkworm (*Anaphe infracta*, Wlsm.) in Uganda (illustrated)," by C. C. Gowdey; "On a New Species of Mite (*Tarsonemus*) Injurious to Sugar-canes in Barbados (illustrated)," by Stanley Hirst; "Notes on *Glossina morsitans*, Westw., in the Luangwa Valley, Northern Rhodesia," by Ll. Lloyd; "Notes on the Blood-sucking Insects of Eastern Tropical Africa" (plates x, xi), by S. A. Neave; "Some Observations on the Bionomics and Breeding-places of *Anopheles* in Saint Lucia, British West Indies" (plates vi-ix), by Dr. Lucius Nicholls.

Notices to Correspondents.

1.—**Manuscripts sent in cannot be returned.**

2.—**As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.**

3.—**To ensure accuracy in printing it is specially requested that all communications should be written clearly.**

4.—**Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.**

5.—**Correspondents should look for replies under the heading "Answers to Correspondents."**

Colonial Medical Reports.—No 8.—Natal *(continued)*.

REPORT OF THE PORT HEALTH OFFICER, 1909.

During the past year the health of this port has been menaced by the existence of serious infectious disease in the following ports, with we are in constant communication :—

Adelaide.—Odd cases of plague have been notified during the past year in man and rats.

Aden.—The endorsement of the Aden Bill of Health, dated March 25, brought by the s.s. *Feldmarschall* on April 18, stated that a sporadic outbreak of small-pox had occurred at that port during the month of March, 1909.

Bombay.—Plague, small-pox and cholera have been in existence throughout the whole year.

Calcutta.—Plague, small-pox and cholera have been in existence throughout the whole year.

Colombo.—Small-pox has been prevalent in sporadic form.

Capetown.—A few cases of small-pox were notified during January and March, since then clean Bills of Health have been issued.

Dar-es-Salaam.—A fatal case of plague occurred on January 8. The s.s. *Kronprinz* arrived here on February 14 with a clean Bill of Health dated January 30.

East London.—One case of small-pox was notified on February 27 and another on April 17, since then clean Bills of Health have been issued.

Freemantle.—The s.s. *Miltiades* arrived here on March 24, and the Bill of Health, dated March 10, stated that there were four (4) imported cases of small-pox isolated out of town.

Karachi.—Plague has been prevalent throughout the whole year.

Madras.—Cholera existed in sporadic form. Four (4) deaths from small-pox occurred on June 18. (Bill of Health *ex* s.s. *Umzinto* which arrived here on July 10). Odd cases of plague are reported from time to time.

Mauritius.—Plague in epidemic form has been in existence throughout the whole year.

Rangoon.—Plague cholera and small-pox have been in existence throughout the whole year.

Sydney.—A few cases of plague in man and rats continue to be found from time to time.

Vizagapatam. — Small - pox in epidemic form throughout the whole year.

Zanzibar.—A few cases of small-pox and odd cases of plague continue to be found from time to time.

Pratique.

During the past year there have been one thousand two hundred and sixteen (1,216) arrivals at this port, made up as follows :—

One thousand one hundred and fifty-one (1,151) vessels were visited by a Health Officer, but of these only one thousand one hundred and thirty-seven 1,137) were charged the fee, earning for Government a revenue of one thousand one hundred and ninety three pounds and seventeen shillings (£1,193 17s.).

The remaining fourteen (14) were men-of-war, which do not pay the fee.

The small coasters are allowed to enter the harbour without a pilot.

Infectious Diseases.—One hundred and twenty-six (126) cases of infectious disease have been reported by ships arriving at this port during the past year, and when necessary have been dealt with by this Department.

From eight ships, bringing two thousand seven hundred and eighty-nine (2,789) indentured Indian immigrants, of whom one thousand eight hundred and eighty-nine (1,889) were examined for ankylostomum infection, it was found that six hundred and seventy-three (673) were infected with that parasite.

Thirty-nine (39) deaths have been reported by ships arriving at this port during the past year.

Rat destruction has been in progress throughout the whole year, with the result that one thousand and twenty-five (1,025) rats were trapped in the point area.

Of these, nine hundred and thirty-three (933) were sent by the Port Captain's Department, for which a bonus of threepence (3d.) per head has been paid, amounting to eleven pounds thirteen shillings and threepence (£11 13s. 3d.).

The remaining ninety-two (92) were received from other sources for which no bonus has been paid.

Poison has also been freely used in the sheds along the wharf at regular intervals.

A second careful trial has been made of a consignment of a bacterial rat-killer received from the Agent-General (Ratin), but the results have not been in any way superior to those obtained from other preparations, and are certainly in no degree commensurate with the very high cost of the article,

Seven hundred and sixty (760) vessels have been searched for evidence of suspicious sickness or undue mortality amongst rats, with a negative result in each case.

Throughout the year special attention has been paid to ships arriving from plague-infected ports, and all ropes and hawsers connecting them with the wharves have been guarded with parcelling, which has been freshly tarred, as well as with tin shields,

The total gross revenue earned by the "Equifex" Machine is ninety-five pounds twelve shillings and ninepence (£95 12s. 9d.).

Passengers' personal effects are sterilized free of charge.

The large "Clayton" machine was used three times during the past year, and the charge made for services rendered amounts to thirty-two pounds two shillings (£32 2s.).

Fumigating Cupboard.—Seven hundred and seventy-three (773) second-hand hats, five hundred and sixty-five (565) pairs of second-hand boots, and one hundred and seventeen (117) leather-lined garments, all of which were imported for sale, have been passed through the Fumigating Cupboard. A charge was made according to the services rendered, and the revenue derived from this source amounts to three pounds fifteen shillings (£3 15s.).

In addition to the above, a large quantity of leather or leather-lined goods, also rubber goods, being personal effects of coloured passengers, were passed through free of charge.

There have been seven (7) vessels treated with liquid disinfectants on account of purely local conditions.

Six of these were charged according to services rendered, and the revenue derived from this source amounts to eight pounds seventeen shillings (£8 17s.)

Rickshaws or carriages employed in conveying patients and contacts to their destinations were similarly treated, but no charge is made in cases of this nature.

The eyesight of four (4) candidates for certificates for navigation of local and coasting craft has been tested.

Local Sanitation.—The wharves, sheds, latrines, &c., have been visited daily. The Wharfmaster's Staff has kept all these localities as clean as possible, and disinfectants have been used freely and efficiently every day.

The improvement in health of the crews of ships lying at the wharves still continues; dysentery and diarrhœa, which used to be of frequent occurrence, only appear very occasionally.

All Government buildings have been visited periodically, and I have much pleasure in again recording my appreciation of the services rendered by Inspector Kendall, of the Borough Sanitary Staff, in supervising the sanitation of the Harbour Department residential houses.

Urgent representations have recently been made to the Engineer, Natal Harbour Department, with regard to repairs, drainage, and other sanitary necessities required in respect to Natal Harbour residential quarters, and a promise has been obtained that these will be complied with at as early a date as possible.

Vaccination.—One hundred and twenty-five (125) small-pox contacts were vaccinated, and for the forty-five (45) tubes of vaccine lymph supplied by this Department, a charge was made of sixpence (6d.) per tube, amounting to two pounds five shillings (£2 5s.).

Salisbury Island.—During the past year ten cases of infectious disease were admitted to the Salisbury Island Hospital.

These cases were discharged recovered after the infection period was over, and the expenses in connection with their treatment was defrayed by the shipping company responsible in each case.

A charge for medical attendance was made in each case, and the revenue derived from this source is thirty-eight pounds seventeen shillings (£38 17s.).

All Government buildings and property have been kept in repair as far as possible, the paths and open spaces have been kept free from weeds, and the tanks have been periodically cleaned.

Whaling Industry.—The site allotted originally to the South African Whaling Co., Ltd., on the south side of the Bluff Channel having been found to be unsuitable for the purpose, this business was transferred early in the year to the back of the Bluff, at the western end of the Concrete Block yard.

The new premises are of a superior nature to those first erected, and the business through a very busy season has been conducted with very little offence to residents in the Point area.

A slight objectionable odour has, however, been noticeable on a few days on the northern side of the Bluff, probably due to very fine oily particles being carried up with the smoke by light southerly winds; this, however, will, I hope, be prevented in the future by the introduction of a proper condenser.

There was an outbreak of enteric fever at this station in October and November. There were five cases.

All were in comparatively early stages of the disease. All lived in quarters at the Whaling Station with one exception, who lived and slept at the old Whaling Station near the Public House Trust at the Bluff. This man took occasional meals at the mess-room of the new Whaling Station.

These facts appear to practically localize the source of infection to the mess-room at the new Whaling Station.

The water supply is from a tap at the kitchen door, and the water is from the Corporation reservoirs. The supply is constant and the question of water-carried infection can be placed out of court.

Milk Supply.—All milk that has been used is tinned milk (Ideal and Harmen's). A supply is mixed with water before each meal. Uncovered jugs are used and flies are numerous. It occasionally happens that the milk stands a considerable time before use.

The coloured people's latrines are sixty (60) feet away from the kitchen door. The latrines in question (which also serve the purpose of urinals), are earthenware receptacles sunk flush with a sloped cement floor, and provided with flush tanks.

At the time of inspection the cement floors were fairly clean, but it is possible that at times they are soiled, although it was definitely stated that the cement floors were washed down daily with Kerol solution.

It is possible that given a "typhoid carrier" habitually using one of these latrines and soiling the sloping floor, that the infection may have been carried by the flies which are numerous.

The infection may, on the other hand, have been carried by the flies from the neighbouring bush where the Kaffirs and Indians employed by the Fertilizer Company, whose premises adjoin the Whaling Station may possibly defæcate.

These sleep and mess apart from the Whaling Station employees and as yet have no special latrine accommodation. Against either of these hypotheses is the statement that none of the coloured employees of either company have been at all ill for a considerable time.

"Typhoid carriers" may possibly at times exist among the indentured Indians who are quartered near by, and whose habits in the matter of defæcation are not all that they should be.

So far as present observations go, it is possible that the infection has been carried by flies from either of the three places enumerated, to the food or milk in the mess-room of the Whaling Station.

The assistant manager has been instructed in regard to the danger which exists if the latrine floors are not rigorously and frequently disinfected.

The septic tank, the effluent, and the foreshore have been carefully examined. The effluent appeared satisfactory and no nuisance existed on the foreshore.

In all other respects the conduct of this business has been entirely satisfactory, and the Manager and Managing Directors have in all cases paid immediate attention to all recommendations made to them by me,

Another site, immediately contiguous to that of the South African Whaling Company, on the eastern side, has been leased by Government to a second whaling company, which has been established with the style of the Union Whaling and Fishing Company, Ltd.

Before issuing permission to this company to proceed with the erection of the premises necessary for the conduct of its business a meeting was called to hear any objections that might be raised by dwellers in the neighbourhood to the inauguration of a second whaling station. Several gentlemen availed themselves of the opportunity of expressing their opinions, but the facts elicited did not seem sufficient to justify the withholding of the permit, which has accordingly been granted.

The plans for the necessary buildings, drainage, &c., of this company, which have so far been submitted for approval, seem to be highly satisfactory and promise that little, if any, nuisance will be caused by the business to be conducted on these premises.

Laboratory,

Hook-worm Infection among Indentured Indians arrived at this Port during 1909.—During the past year eight (8) ships have arrived at this port with two thousand seven hundred and eighty-nine (2,789) Indian immigrants.

During the absence of the Government Pathologist on leave I had much pleasure in performing those parts of his duties which related to Medical Jurisprudence, the examination of specimens for private practitioners, and of samples of disinfectants for the Collector of Customs.

The work done in this connection amounted to:—

Medical Jurisprudence, 14 cases ; 43 exhibits.

Disinfectants tested for action on pure typhoid culture, 8 specimens.

Specimens examined by private practitioners, 12 specimens.

The amount chargeable on these accounts, according to tariff, was eighty-eight pounds seventeen shillings (£88 17s.).

During the past year four hundred and twenty-nine (429) rats were microscopically examined for plague with a negative result in each case.

H. E. FERNANDEZ,
Port Health Officer.

Colonial Medical Reports.—No. 1.—Calcutta.

MEDICAL REPORT FOR THE YEAR 1909.

By T. FREDERICK PEARSE, M.D., F.R.C.S.Eng., M.R.C.P.Lond., D.P.H.Cantab.,

Health Officer to the Corporation and Special Health Officer (for Plague).

IN my report for the year 1908 I drew attention to the fact that the climate was on the whole cooler and drier than usual, the lessened humidity being a special feature. Concurrently with these meteorological conditions the year was an exceptionally healthy one, the estimated rate of mortality having been lower than for ten years previously.

In 1909, the meteorological conditions were different. The early part of the year was hotter and drier than usual and the rainfall was exceptionally small, but during the second quarter the humidity was in excess and there was also more rain preceding the regular monsoon. The monsoon was nearly two weeks earlier than usual and the total rainfall was in excess. During the latter part of the year there was less rain, but the humidity was of about the average. Generally the atmospheric conditions were not so favourable as in the preceding year, the average humidity having been distinctly higher. It is probably this factor which, more than others, affects the public health.

VITAL STATISTICS.

In presenting the following particulars regarding the mortality in Calcutta, and the several causes which bring it about, I must point out that our vital statistics are entirely dependent upon the accuracy of the registration of deaths and upon the corrections made after inquiry into the causes of deaths as given at the several burning-ghats

and burial-grounds. The inquiries into the causes of deaths have been made since 1903 by the Medical Inspectors of the Plague Department and their reports have been daily scrutinized by the District Health Officers and myself. Too much importance cannot be attached to these inquiries as it is found by experience that nearly 50 per cent. corrections have to be made in the returns of the causes of deaths as given at the several burning-ghats and burial-grounds. This is one of the most important pieces of work which the Plague Department has performed for the benefit of the city. I refer to it here because some attempt has been made to reduce the staff and to minimize the importance of the work carried out. I need only refer to the vital statistics of the provinces which are dependent, so far as the causes of deaths are concerned, upon the haphazard opinions of the individuals who happen to register each death. These causes have in a few instances been checked and the proportion of error has been found as large in the provinces as in Calcutta. The correct policy is therefore to take every reasonable means to ensure accuracy, and I need hardly say that a reduction of the already small staff would be followed by a vitiation of our statistics which would render them practically worthless. I do not hesitate to say that the mortality returns before the year 1903, as well as those for the mofussil up to the present time, are of little value.

Notwithstanding that the total number of deaths during 1909 was higher than in the previous year, the health of the city may be considered to have been good. The increase was chiefly due to the larger number of deaths from small-pox, plague, and epidemic dropsy. If we deduct the numbers of deaths from zymotic diseases in each year and then make comparison, the mortality from "all other causes" is shown to have become slightly less. Epidemic diseases are so uncertain in their incidence and fatality that in order to estimate the conditions in the city influencing the public health, some of them at least must be eliminated from our calculations. The effect of special diseases must be considered separately.

General Mortality (1900-1909).

(Excluding that from Cholera, Small-pox and Plague.)

1900	24,591
1901	20,756
1902	21,289
1903	19,503
1904	20,504
1905	22,214
1906	22,278
1907	23,262
1908	21,638
1909	21,323

The total mortality for the year was 28,946, which is equivalent to a rate on the census population (847,796) of 34.1 per 1,000, the mean ratio of deaths per 1,000 during the previous five years having been 35.2.

As I explained in detail in my last report this "crude" rate is not the correct one. No allowance has been made for the increase of the population, nor for the peculiar constitution of the population as regards the excess of males, the excess of young adults, and the comparative paucity of children. Corrected for increase of population alone, the death-rate may be taken at 28.7 per 1,000, and is only slightly higher than that of 1908. The death-rate in Bombay for 1909, based on the quinquennial census of 1906, was 35.5 per 1,000. Calcutta therefore compares favourably with Bombay. Corrected for the peculiar constitution of the population, the rate on the other hand becomes raised because the excess of young adults should be attended by a lower death-rate as compared with a normal population (*e.g.*, that of the whole of Bengal). Similarly with the comparative absence of young children the rate should be lower. By calculations which were explained in my last report we can estimate the influence of these factors, and it is found that, allowing for increase of population, and also for the peculiar constitution of the population as compared with that of Bengal, the death-rate works out at 34.9 per 1,000. This must be considered as the true death-rate for the city during 1909. Compared with 1908, this corrected rate is 2.6 points higher. Herein lies the value of a correction of the rate, because it leads to inquiry as well as affording a satisfactory basis of comparison with the death-rates of other cities. An analysis of the mortality at the several age periods gives us the solution. We find that the deaths of children under 10 years increased, while the deaths of persons between the ages of 20 and 40 decreased. The deaths of persons over 40 were also greater.

We now estimate the population of Calcutta at 1,009,008. On this basis, 28,947 deaths give us a rate of 28.7 per 1,000, but the number of deaths which would have occurred if the population of Calcutta were similar in composition to that of Bengal is estimated at 35,285, and it is this estimated number of deaths which gives us the true death-rate (34.9) for the city.

The death-rate amongst females (44 per 1,000) was, as usual, much higher than amongst males (29 per 1,000), but the difference was still more marked in the past year as compared with 1908.

The excess of deaths amongst females begins from 10 years, and is particularly marked between the ages of 15 and 40, but it continues even up to the latest periods of life. It is not entirely explained by the deaths (551) peculiar to women (from childbirth, &c.), but together with these causes of mortality females die in greater proportion than males from phthisis, bronchitis, small-pox, malaria, and "other causes." This greater mortality amongst females is found not only in every district, but in every ward in the city.

Colonial Medical Reports—No. 1.—Calcutta (*continued*).

The mortality rates for different parts of the city vary with one important exception (the Fringe Area) to much the same extent as heretofore. Urban Calcutta had a death-rate of 31.4 per 1,000, whilst the rate for the suburbs was 42.1 per 1,000. In contrast with 1908, the Fringe Area showed a marked improvement, the rate being 28.2 per 1,000 as compared with 33.7 in the previous year, and against 37.9, the mean of the previous five years. The most striking improvement is with regard to malaria. In 1908 the Fringe Area suffered more even than the suburbs, but during last year the death-rate from this disease was only 1.8 per 1,000, as against 2.8 for the suburbs. "Other fevers" also were much less prevalent than in the other areas of the city. Again, with regard to dysentery and diarrhœa, the Fringe Area not only showed a marked improvement on the previous year, but the death-rate from these diseases was also less than that of any other part of the city. On the other hand, the mortality from small-pox was greater in the Fringe Area. The striking improvement in the mortality of the Fringe Area is probably explained by the effects of the drainage operations which have been recently conducted in this area. I am informed that from about the beginning of the rains the sewers laid in the Fringe Area south of Gas Street were nearly all brought into use. Previous to this date the works had been in progress but no connection had been made between the main sewer and Palmer's Bridge Pumping Station. Also early in the rains the Lower Circular Road sewer was temporarily connected up with the Fringe Area new sewer. It is to be noted that no communications were made before the rains, but the excavations which were made before this date had to be kept dry by pumping. It is reported to me that the level of the subsoil water had been markedly lower since about November, 1908. From an incident which occurred during some more recent excavations (December, 1909) for the low level sewer of the southern part of the northern section of the Fringe Area drainage scheme it is evident that the Circular Canal drains largely by percolation into the soil of at least a portion of the Fringe Area. Chemical tests proved the transit of canal water in large quantities and at a rapid rate to the centre of the Fringe Area at least 700 ft. from the canal. The northern section of the scheme was not taken up in 1909, and no operations were conducted. It is evident, however, by our mortality figures that the drainage operations in the southern part favourably affected the northern part, probably by some underground outlet to the southern section.

The suburban wards suffered less from small-pox and plague, but kept up their bad reputation for malaria and "other fevers." The scourge of the suburbs, however, are the diseases grouped as dysentery and diarrhœa, the death-rate from these diseases being 4 per 1,000, as compared with 2.1 for the whole city, 1.4 for the old Town and 1.1 for the Fringe Area.

The mortality is least in the rainy season and greatest in the months of March, April and May, the explanation being that cholera, small-pox and plague cause the increase during the spring months, whilst the death-rate under nearly every head is reduced during the monsoon. The deaths from malaria and "other fevers" are strikingly less during the wet season, and even the deaths from tubercle are less also. The one group, however, which showed no appreciable reduction at this season during 1909 was that of "dysentery and diarrhœa."

Before closing this section, it must not be overlooked that great changes have taken place in the distribution of the population since the Census of 1901.

Not only has the population increased, probably to a large extent, but it is now differently distributed over the city. The wide variations in the rates of mortality, not only in the whole population of the several wards but amongst the several classes in the same ward and amongst the same classes in different wards, point clearly to marked changes in the distribution of the inhabitants. Our statistics are vitiated accordingly, and it is impossible to place reliance on the rates of mortality for small areas, or on the rates amongst classes in such areas. So far as the numbers of deaths are concerned, and also of the returns for the chief diseases, our statistics are, I believe, fairly accurate, but it is impossible to explain, *e.g.*, why the Mohammedans in Ward 6 should have had the small death-rate of 13.5 per 1,000, whilst their co-religionists in the adjoining Ward 5 died at the rate of 67.3 per 1,000; or again, why the death-rate amongst Hindus was 34 per 1,000 in Ward 19 and 61.8 per 1,000 in Ward 20. Such wide variations from the average are not explained by the known different incidences of diseases in local areas. Moderate differences are constantly being brought about by the varying incidence of cholera, small-pox, plague, phthisis and other diseases amongst a special class, or from causes affecting local areas; but a study of these statistical tables leads me to believe that the next Census will show remarkable changes in the number and distribution of the population.

The Registration of Births.

The past year was the first complete year in which the system of having peripatetic sub-registrars of births was in force for the whole city. Having given promise of better registration after a two years' trial in District I it was extended to the four Districts in October, 1908.

It has been found, however, that much of their time is wasted, and as the vaccinators go over exactly the same ground and have to make inquiries in practically the same houses and quarters, it is suggested that the vaccinators who in ordinary times have comparatively light work should take over the duties of the birth sub-registrars, in addi-

tion to their own. This will allow a reduction of the staff. Instead of 29 sub-registrars and 24 vaccinators, we shall be able to get the combined work done with 34 vaccinators.

Births and Birth-rate.

The registration of births has greatly improved during the past year, the total being 19,423 as against the previous highest total of 17,043 registered in 1908. The improvement is shown in all four districts.

Summary.

Birth-rate on census population		22.9	per 1,000
,, ,, estimated population		19.2	,,
,, ,, equal number of males to females in population	Census ...	34.0	,,
	Estimated increase ...	28.8	,,
,, ,, ditto with further correction ...		27.4	,,
,, ,, female census population ...		68.0	,,
,, ,, estimated female ,, ...		57.2	,,
,, married female census population, ages 15–45		187.7	,,
,, estimated married female population, ages 15–45		157.0	,,

The ratio of male to female births is as 110 to 100. This is very high, compared with that for the previous year (viz., 107), and is a high rate for any population.

The still-births were 1,397, as against 1,038 in the previous year. These are not counted in the statistics either as births or deaths. The still-births were about 7 per cent. of the live births—a high figure and higher than that of last year (5.7 per cent.). This, I think, is accounted for by better registration.

Special Diseases.

Cholera.—The total deaths amounted to 2,022 giving a rate of 2.3 per 1,000, and of this total no less than 1,682 occurred amongst Hindus. These figures give a rate of 3 per 1,000 amongst Hindus and of 1.3 per 1,000 amongst Mohammedans. Other classes suffered but slightly.

The total mortality was considerably less than that of the mean ratio during the previous five years.

Small-pox.—The outbreak of the spring of 1909 was a severe one, the total mortality for the year being 3,784, giving a death-rate of 4.4 per 1,000, as compared with 1.2, the mean ratio of the previous five years.

Of the total, Hindus had 2,809 deaths—a mortality much in excess of their proportionate numbers in the general population—the rates being: Hindus 5.09 per 1,000, Mohammedans 3.3 per 1,000. Females suffered much more severely than males, the death-rate amongst females being 6 per 1,000, as against 3.6 per 1,000 amongst males. The severe outbreak ceased in the month of June, only 19 deaths occurring after that date.

As with all the other infectious diseases, comparatively few cases are notified during life, and it is impossible to say, therefore, what the case-mortality was. Judging from the proportion of deaths amongst the cases taken to hospital the outbreak was an unusually fatal one.

Vaccination.

In consequence of the severe outbreak of small-pox, the number of vaccinations performed was very large.

Summary.

Primary Vaccinations at Stations ...		12,884
,, ,, Homes ...		15,388
		28,272
Re-vaccinations		60,094
Grand Total		88,366

The Animal Vaccine Depot Ballygunge.

A large quantity of excellent vaccine lymph was prepared during the year, and notwithstanding the outbreak of the spring there was stock in hand of twice the amount of that which was required.

During the year 75 calves were purchased, but only 36 were used; the remainder, except nine rejected, were prepared for vaccination for the current calendar year.

These 36 calves yielded 8,538 gr. of pulp which, mixed with glycerine and water, gave 43,068 gr. of lymph.

The calves after purchase were isolated and were then tested against tuberculosis. Four calves were rejected by this test. After three weeks the healthy calves were vaccinated. The pulp is now taken 96 hours after vaccination instead of at 120 hours, as formerly practised. This plan does not produce so much lymph, but the lymph obtained is purer and freer from extraneous micro-organisms. During the year no less than 44,820 tubes of vaccine were issued. Of this number 38,160 were issued to the Districts, 2,283 were sent to the head office, and 490 were issued free of charge, chiefly for vaccination at the depôt. There were 3,887 tubes sold at the depôt, besides those sent out from the head office.

Measles.—This disease has not hitherto been either a prevalent or fatal one. The mortality fluctuates widely from year to year, as in 1908 there were 220 deaths, whilst for last year only 86 were recorded. During the first three months of the present calendar year a considerable number of deaths have been registered, and I am inclined to think we shall have more of this disease in the future. It is significant that while in 1908 the deaths chiefly occurred in the first four months and were almost limited to the northern portion of the city, they have during the past year been fairly equally distributed over the four districts and over the whole twelve months.

It is probable that many deaths amongst children put down to bronchitis have been primarily due to measles, with bronchitis as a complication.

Diphtheria.—This disease, usually attended with a high mortality, is happily uncommon in Calcutta.

Nineteen deaths only were reported, and there were only 34 and 27 deaths respectively in the two previous years. Half the cases were in District I. There were twelve deaths amongst females to seven amongst males, an excess giving four times the ratio to females.

Plague.

The recrudescence of this disease in the spring of 1909 was fully described in my Annual Plague Report. The total mortality (2,117) for the whole year was rather larger than in the previous year (1,779).

The outbreak itself was characterized by a very sudden and severe rise in the first week of May. This period of high mortality, however, only lasted for about ten days, and the recrudescence rapidly subsided.

Inoculations were 363. No death from plague is known to have occurred amongst the inoculated. The live rats brought for destruction numbered 56,863, and the cost of the rewards for the same was Rs. 3,106. There were 22,005 dead rats reported as having been found in the streets. The number of disinfections of houses was 4,883.

Beri-beri or Epidemic Dropsy.

In my Report for 1907 I referred to the reappearance of this disease during the latter half of the year after an apparent absence since 1901. In the latter year, as in 1879 to 1881, the cases were very few in number. During 1907 a considerable number of cases occurred which may be roughly estimated at from 300 to 400, but only 15 deaths were recorded. The disease was first reported at the Alipore Reformatory, and subsequently cases were seen in widely scattered parts of the city. Some cases and groups of cases were very mild and others, on the contrary, were very severe.

The most essential symptom is dropsy, œdema of the lower limbs first occurring, the trunk and upper extremities being subsequently affected in severe cases. Fever is merely nominal, only a few of the cases showing any rise of temperature, and even amongst these it seldom exceeded 101.8° F. Deep-seated pains in the feet and legs were generally described and distinct tenderness of the calf muscles was detected in a fair proportion of cases. The knee-jerks were impaired or lost in many instances, and weakness with unsteadiness of gait was noticeable in many of the severer cases.

A dry cough, with shortness of breath, was common, and cardiac troubles in the form of palpitation, irregularity of beat, rapidity of pulse, and murmurs have been numerous. Anæsthesia has been detected in this outbreak (not noticed in previous ones), and definite paretic conditions with subsequent wasting of the muscles has been seen in several of the severer cases. From the similarity of these symptoms to those of beri-beri, it is important to note what are called negative symptoms, because they are common to both beri-beri and so-called epidemic dropsy. The central nervous system was unaffected, the lungs showed no lesions, the digestive functions (except perhaps for a preliminary vomiting and diarrhœa noticed in some of the cases) seemed unimpaired, and there was no albumin in the urine.

The dropsy was of the same character as beri-beri, the nervous phenomena, viz., those of more or less severe peripheral neuritis, were identical, and death was brought about in a similar manner, sometimes suddenly and sometimes slowly, by nervous disturbance of the heart's action. The disease seems essentially a household disease, cases only occurring in groups where people are closely associated together. All ages and both sexes, the weak as well as the strong, the well-to-do along with the poor, are equally attacked.

It is apparently a communicable disease, and the succession of cases suggests that the incubation period is about three days.

The outbreak continued through the cold weather of 1907-08, but gradually subsided. Thirty-three deaths were reported for that year.

As a result of observations of the outbreak of 1907, I formed the opinion that beri-beri and epidemic dropsy were the same disease, and I published an article in the Journal of Tropical Medicine (March 2, 1908) on the subject.

Before I refer in detail to the present outbreaks, some information of the previous occurrence of this disease may be interesting. It appeared apparently for the first time in Calcutta in 1877. Again in 1878 and 1879. Also in Assam and in Mauritius in 1878. The Calcutta outbreak was limited to a particular quarter, and death-rate was high. Elsewhere there were but few deaths. A small outbreak, attacking a few households only, occurred again in Calcutta in 1901, and a few cases were reported in Madras also. No further cases were reported until the outbreak in the Alipore Reformatory in July, 1907. Fifty cases were then reported, and shortly afterwards other cases were noted in different parts of the city. This outbreak continued until the spring of 1908, and during the course of about nine months a large number of cases were heard of, but the mortality was small. In 1907 only fifteen deaths were registered as due to this disease, but for the year 1908 there have been registered 33 deaths. The present outbreak apparently commenced in July, and was first reported in the northern half of the city.

There is considerable difference of opinion amongst the profession in Calcutta as to this disease. Some, following McLeod, conclude that epidemic dropsy is a disease *sui generis*, others recognizing the similarity of the symptoms with those of beri-beri consider that these outbreaks are those of the latter disease. In 1877 many physicians in Calcutta looked upon the cases of so-called epidemic dropsy as a form of beri-beri, and Manson admits that in many respects it (epidemic dropsy) resembles very closely those cases of beri-beri in which dropsy is a prominent symptom and in which the nervous phenomena are slight or altogether absent.

With our experience of this disease since July, 1907, it is impossible to accept all the conclusions of the writers before that date. The two diseases present such similar symptoms that there is no clear distinction between them. The essential symptom of both are dropsy and peripheral neuritis, though perhaps in different degrees in different outbreaks. Death is brought about in a similar manner, sometimes suddenly and sometimes slowly, by nervous disturbance of the heart's action. I cannot accept the conclusion of one authority, that " the knee-jerks were always present and no anæsthesia could be detected in any stage of the affection, *thus distinguishing epidemic dropsy from beri-beri.* I am aware that some physicians would still hold to the same distinction, but must reply that if these two signs are to differentiate the two diseases, then we must look upon the present epidemic and that of 1907-08 also as of beri-beri, and not of epidemic dropsy at all. If we do this we are landed in other difficulties, namely, that our cases in Calcutta correspond almost entirely to the " wet " form of beri-beri, and show few, if any, examples of the so-called " dry " variety. It is not necessary for me to give a scientific exegesis on this subject here. It is sufficient, perhaps, for me to say that the disease now prevalent is apparently a communicable disease (occurring most commonly as a series of cases in families), characterized by dropsy, chiefly of the lower extremities, and by the symptoms of peripheral neuritis, viz., tingling numbness, tenderness of the muscles, weakness of the limbs, and affection of the heart. There is often slight fever, occasionally vomiting, somewhat frequently diarrhœa and at times a " measly " sort of rash. More and less weakness or prostration occurs in all cases, and anæmia frequently accompanies the later stages. The course of the attack is uncertain, some dying within a few days, others dragging on in a convalescent state for many months.

Since January 1 the mortality has lessened very considerably, and now (April) very few new cases are occurring.

On the Provision for the Removal of Infectious Cases to Hospital.

The Infectious Ambulances.

In my Report for 1907 I referred to the inadequate provision for the removal of infectious cases to hospital. At that time (May, 1908), there were six " Ashford litter " pattern wheeled ambulances in the hands of the police, together with some old *palkis* and some *kutcha doolies* handed over after the *Ardhodaya Joge.* The removal of infectious cases was, therefore, practically in the hands of the police, the ambulances having been provided by the Corporation. In practice, however, ordinary *ticca gharis* and *palkis* were chiefly used by the public, the ambulances being only occasionally employed when application was made for them.

The small-pox outbreak of the spring of 1909 severely tested the then existing arrangements, and an inquiry was instituted. It was found that only 62 infectious cases had been removed in the Corporation ambulances supplied to the police during the quarter ending March 31, 1909, notwithstanding the severe outbreak of small-pox which raged for part of this period, and inquiries from the hospitals showed that *ticca gharis* and *palkis* were chiefly used. The horse ambulance kept at Lal Babar (belonging to the Corporation) was originally intended for accidents and cases of sudden illness only, but some misapprehension existing on this point, opinion was sought as to whether a horse ambulance should be maintained for infectious cases, and most of the hospital authorities considered such an ambulance desirable.

The whole question then came before the Health Committee, and the Corporation resolved in August, 1909, that the police should be relieved of the charge of " infectious " ambulance, and that the wheeled ambulances should be kept at the different hospitals. It was also decided to utilize the existing horse ambulance for infectious cases. The recommendation that the ambulances should in future be kept at the hospitals and not by the police was accepted by the Lieutenant-Governor.

An immense amount of disinfection of houses has been done for cholera, plague, small-pox, beri-beri, typhoid and other infectious diseases, but the quantity of clothing and bedding either sent by the public or collected by the staff for steam disinfection was extremely small. The explanation is that the majority of deaths from infectious diseases occurs amongst the poorer classes and that by the time the house is visited all the infected bedding and clothing has either been destroyed or otherwise disposed of.

The use of the steam disinfecter is expensive unless large quantities of articles are received.

Tubercle of the Lungs (Phthisis).

This disease caused 1,949 deaths, giving a rate of 2.3 per 1,000. This compares with 2.4 for Bombay in 1908. All parts of the city seem to be about equally affected, but in consequence of the prevalence of the disease in wards 19 and 20 (especially), District III shows the highest rate of mortality.

Females have a death-rate of 3.2 per 1,000, as compared with 1.8 for males. The high rates amongst females occur in Wards 5, 6, 7, 8, 9, 10, 14, and 19. There is no seasonal incidence.

Since detailed inquiries have been made into the causes of deaths (viz., since 1904) it has been found that the mortality from the disease was much higher than the old statistics indicated. During the past five years the mortality has been steady at rates varying from 2.4 to 2.6 per 1,000.

Phthisis prevails amongst the Hindus and Mohammedans in about the same ratio as the proportions of their respective populations, but the females of both classes suffer more than the males, and amongst Mohammedan females the rate is very high.

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DISEASES OF THE RESPIRATORY ORGANS.

This class contains the highest number of deaths, which in 1909 amounted to 4,994, giving a rate on the whole population of 5.8 per 1,000. In 1908 the rate was 6.1 per 1,000, and in 1907 it was 5.9. Compared with Bombay (11.0 per 1,000 in 1908) the mortality is low. These diseases chiefly affect the very young and the old, but 845 cases of acute pneumonia are included in the total. Phthisis is separately classified.

Except for acute pneumonia, from which Hindus suffer more than Mohammedans, the mortality in these two communities is proportionately the same. Mohammedans, however, seem to suffer more from bronchitis. Little or no change has occurred in the incidence of these diseases in Calcutta during the past few years.

Dysentery and Diarrhœa.

As it is not always easy to distinguish between these intestinal diseases they are grouped under one heading as heretofore, but of the total of 1,780 deaths, 1,377 were returned as due to dysentery. In addition we have 403 deaths due to simple diarrhœa, chiefly in infants and old people.

Females suffer about 50 per cent. more than males, and Hindus have a much higher rate of mortality than Mohammedans. It should be noted that the mortality from these diseases has been decreasing during the past five years.

THE BILIARY CIRRHOSIS OF INFANTS, OTHERWISE KNOWN AS INFANTILE LIVER.

In my Report for 1908 I gave a detailed account of this disease, which continues to kill off so many infants and young children. In 1907 there were 636 deaths. In 1908 there was a total of 727. Of this total 190 deaths occurred in children under 1 year of age.

Diseases of Childbed.

The number of deaths connected with childbed was very large and formed 2.5 per cent. of the total number of registered births.

In the previous year the rate was 2.7 per cent. This, compared with the mortality directly or indirectly caused by child-birth in England, viz., 4.8 per 1,000, is excessively high. In Calcutta puerperal fever is very prevalent and indicates ignorance and carelessness in the treatment of the mother after delivery.

Malaria.

This disease, so prevalent and fatal in many parts of Bengal, is not so severe in Calcutta as many people imagine. All sorts of fevers are labelled as malaria, and the statistics of the mofussil as well as of this city in times gone by, are not to be relied upon. By careful inquiry into the course of every fatal illness we are enabled to correct the causes of deaths reported at the burning ghats and burial grounds. The corrections amount to 50 per cent. of the total, and malaria seems to be a popular cause of death from many varieties of sickness. The deaths from malaria were 1,393, as compared with 1,583 in the previous year, and occurred chiefly in the cooler months of the year (October to March).

Females suffer much more severely than males in all parts of the city, and it is a curious fact that Mohammedans are more affected than Hindus.

The Work of the Mosquito Gangs.

In the latter part of 1908 the Corporation sanctioned the appointment of ten mosquito brigades for six months. It was thought inadvisable to commence in the middle of the hot weather, so the work was not started until October 1, 1909.

The ten brigades consisted each of one inspector and three coolies. The work consisted in finding out the tanks, pools, puddles, drains, ditches and other collections of water in which mosquito larvæ were prevalent, and in treating the water with kerosine oil. A small quantity of oil goes a long way as it readily diffuses itself over the surface of the water. The thin skin or layer of oil prevents the young (larvæ) of the mosquito from obtaining air when they rise to the surface to breathe. They therefore die off, and if the water be regularly treated with oil at suitable intervals the collection of water ceases to be a breeding ground for mosquitoes. Each mosquito gang can therefore work a large area daily, but the same ground has to be gone over every few days. These measures are sufficient for all public places and for some private grounds, but mosquitoes will breed in almost any collection of water—flower-pots, buckets, tubs, uncovered cisterns, surface drains out of level, &c., &c.—in fact, in any collection of water which remains undisturbed for a week or ten days. Many persons suffer from mosquitoes by neglecting to see that their compounds are not cleared of such collections of water. A house-to-house visitation to see into these details would require a large staff.

The results are not definite, and it must be admitted that the reports are contradictory. The opinion of residents has been freely sought and many have testified to the relief from mosquitoes obtained. There is no question that the treatment of ditches, ponds, &c., with kerosine has stopped the breeding of mosquitoes in places so treated, but the thousands of places in which these insects find opportunities of depositing their eggs have not all been discovered and consequently the results are imperfect.

As to what effect these measures had on the prevalence of fever it is difficult to say. Some of the residents have stated that fever has been less prevalent. As the work only commenced last October our mortality statistics will not help us. The lessened death-rate from these diseases commenced, however, in June, and must be attributed solely to the drainage operations carried on in this area before this date.

In consequence of an outbreak of fever in and to the south of Hazra Road some extra mosquito

NOMENCLATURE OF DISEASES AND DEATHS THEREFROM DURING 1909.

Causes of death	Total
(1) *Acute Specific Diseases*—	
Cholera	2,022
Small-pox	3,784
Plague	2,117
Measles	85
Influenza	2
Enteric (or typhoid)	240
Remittent fever	910
Cerebro-spinal meningitis (epidemic)	20
Acute pneumonia	845
Diphtheria (and croup)	19
Erysipelas	40
Septicæmia and pyæmia	24
Acute rheumatism (rheumatic fever)	75
Dysentery	1,377
Beri beri or epidemic dropsy	433
Hydrophobia	14
Tetanus	1,036
Syphilis (*a*) acquired	31
(*b*) congenital	23
Tuberculosis (*a*) phthisis	1,885
(*b*) other forms (tabes scrofula)	64
Leprosy	91
Chicken-pox	1
Other and rare fevers (fever, whooping cough, relapsing fever, scarlet fever, glanders, anthrax, typhus, &c.)	416
(2) *Parasitic Diseases*—	
Malaria (and intermittent fever) (and ague)	1,393
Tropical cachexia (kala azar)	12
Elephantiasis	7
Other parasitic diseases (worms, &c.)	11
(3) *General Diseases*—	
Cancer	80
Gout	2
Diabetes	153
Rickets	21
Chronic rheumatism	1
(4) *Development Diseases*—	
Premature birth	495
Debility at birth	765
Wasting and marasmus (malnutrition)	15
(5) *Old Age*	1,360
(6) *Poisons*—	
Alcoholism	5
Drugs (not suicide), cocaine, morphia, &c.	15
Trade poisonings	1

Causes of death	Total
(7) *Diseases of Digestive System*—	
Gastritis (*a*) acute	34
(*b*) chronic	36
Diarrhœa and Intestinal catarrh (*a*) acute	138
(*b*) chronic	265
Enteritis (*a*) acute	186
(*b*) chronic	76
Appendicitis	6
Hernia (and intestinal obstruction)	18
Hepatitis and cirrhosis	51
Abscess of liver	218
Infantile liver	651
Peritonitis	29
All other diseases of digestive system	40
(8) *Respiratory System*—	
Laryngitis and œdema	2
Bronchitis (*a*) Acute	1,679
(*b*) Chronic	1,657
Asthma and emphysema	176
Broncho-pneumonia	564
Pneumonia, chronic	53
Pleurisy (all forms)	18
Other diseases of system	2
(9) *Diseases of Circulatory System*—	
Valvular disease of heart	53
Angina pectoris	5
All other diseases of the heart	415
Aneurism	2
Phlebitis (and varicose veins)	2
Other diseases of blood-vessels	37
(10) *Diseases of the Nervous System*—	
Insanity (all forms, including general paralysis)	16
Diseases of spinal cord (paraplegia, &c.)	46
Meningitis (not cerebro-spinal)	50
Hemiplegia	201
Apoplexy	169
Chorea	20
Convulsions (not puerperal)	214
Epilepsy	18
All other diseases of nervous system	35
(11) *Diseases of locomotive system* (arthritis)—	
Diseases of bones, joints and muscles	11

Causes of death	Total
(12) *Diseases of Urinary System*—	
Acute nephritis	8
Chronic nephritis (and Bright's disease)	76
Uræmia	3
Diseases of bladder	6
Calculus (stone)	8
Other diseases of urinary organs	50
(13) *Diseases of Generative System*—	
Diseases of uterus, ovaries, &c.	10
(14) *Diseases of the Blood and Ductless Glands*—	
Anæmia	8
Diseases of spleen	43
,, ,, lymphatic glands	10
,, ,, thyroid	2
Other diseases of blood, &c.	3
(15) *Diseases of Skin and Connective Tissues*—	
Abscess	15
Ulcer	35
Carbuncle	15
Cellulitis	36
Gangrene	34
Other diseases (cancrum oris, &c., &c.)	13
(16) *Diseases of Childbed*—	
Puerperal fever	225
Puerperal convulsions	32
Puerperal diarrhœa (*sutika*)	107
Abortion and miscarriage	6
Childbirth	127
(17) *Accidents*—	
Gun Shot	2
Wounds	4
Burns and scalds	82
Drowning	53
Other accidents (falls, &c.)	235
(18) *Various* (unclassified)—	
Sunstroke (and heat stroke)	2
Starvation and neglect	7
Suicide (all forms)	72
Murder	2
Tumours	6
(19) *Ill-defined and Unknown*	506
Total	28,946

gangs were engaged for the southern district and this infected area was particularly attended to. The deaths were very few in number and after a time the feverish attacks subsided. It is difficult to say whether the work of the mosquito gangs can be credited with the improvement.

Enteric Fever.

This disease shows signs of increase. The disease is more prevalent among "Non-Asiatics" than other classes, and is proportionately much more fatal amongst Hindus than Mohammedans. Males and females were attacked in about equal proportions.

WORK OF THE SANITARY INSPECTORS.

It is very gratifying to be able to record a large increase of works by the sanitary inspectors. This applies to all districts.

THE COWSHEDS OF CALCUTTA.

As so much unfair comment has been made on the apparently neglected condition of many of the cowsheds it is perhaps well that the Commissioners

should appreciate the means at the disposal of the executive.

The question may be considered in its broad aspect. It is not whether any particular cowshed in a ward is in a bad state, because for each defective cowshed there may be a satisfactory explanation, but whether there has been a reasonable improvement in the general condition of these sheds during the past few years. I maintain that there has been an improvement and what is more an accelerated improvement, and that having regard to the conditions and limitations under which the staff works the progress has been distinctly satisfactory.

The duties of the sanitary inspectors are now almost entirely limited to those connected with so-called sanitary matters, their medical duties being confined to inquiries concerning cases of infectious diseases. I look forward to the time when the staff of the Health Department can be divided into a medical section and a sanitary section. This will be possible after the amalgamation.

Some misconception of the work of the Health Department seems to exist, together with a want of recognition of the great increase in the work during the past few years.

Fines Realized.

The total amount realized from fines was Rs. 31,752, as compared with Rs. 27,982 in the previous year. Under the following section the average amount of the fine was lower even than that of last year. In some sections the average fine was slightly higher. The average fine for all sections has fallen from Rs. 11¾ in 1907, to Rs. 9½ in 1908, and to Rs. 8-6-0 in 1909.

Under section 320 (failure to repair and remove privy) the average fine dropped from Rs. 22½ to Rs. 5-9-0; and under section 326 the average fine dropped from Rs. 22½ to Rs. 7-2-0. Under section 444 the average fine was only Rs. 13-12-0 as against Rs. 20 in the previous year. For keeping animals so as to be a nuisance the fine dropped from Rs. 81/5 to Rs. 5-12-0; and for failing to pave, &c., markets, from Rs. 20 to Rs. 4. This latter small fine may be compared with the fine of Rs. 10-8-0 for not registering a drug shop.

Failure to register births was punished with the small fine of Rs. 2-3 as against Rs. 4 in 1908. The average fine under the Vaccination Act was only Rs. 1-7-0.

I draw special attention to the small fines imposed for failing to provide drainage for undrained premises, average fine Rs. 4-12-0; for using building unfit for human inhabitants, Rs. 13-12-0; for keeping animals so as to be a nuisance, Rs. 5-12-0; for using a market without a licence, Rs. 6-2-0.

It is obvious that unless people are adequately punished for failure to carry out sanitary improvements our notices and prosecutions are useless in a very large number of instances.

Better supervision of the meat supply calls for more veterinary assistants, the municipal cowshed will require a small staff, and more dhobikhanas and municipal markets are being talked about.

A female sanitary inspector was for the first time appointed on March 1, 1909, and has since continued temporarily as an experimental measure. She is posted in District III, within which her work is at present exclusively confined. Her services have been of special value in that she could reach the *zenana*, advise women in respectable houses, discover sanitary defects in places otherwise inaccessible to Corporation officials, investigate cases on first hand and become useful in various other ways. Altogether the appointment seems to me to have been fully justified by the results, and I am strongly of opinion that it should be extended to other districts and be made a permanent institution, as in the principal English cities. Unfortunately, however, although my recommendation to this effect was supported by the Health Committee, it was not accepted by the Corporation, and even the present appointment in District III has not been made permanent.

The work in the Laboratory increased considerably during the year under review, specially with regard to the bacteriological examinations of the Hooghly River water and the filtered water supply, and to the analysis of foodstuffs.

Altogether 2,268 samples were analysed during the year as compared with 1,702 in 1908, showing an increase of 33 per cent. over those of the last year.

The treatment of the river water with alumino-ferric was successfully employed during the rains to remove the opalescence in the river water due to the suspension of fine mineral particles. The samples of alumino-ferric used in the treatment of water were examined and found free from arsenic.

Bacteriological examinations of the river water and the filtered water supply of Calcutta.—As more reliance is placed on the bacteriological examination of a water supply to indicate its freedom or otherwise from excremental pollution and from pathogenic organisms specially concerned in water-borne epidemics, the Calcutta filtered water is examined bacteriologically in three different stages.

(1) The river water at the intake at Pulta is examined quantitatively for its total bacterial content and qualitatively for the presence of excremental organisms, particularly of the bacilli of the "colon group."

(2) The water of each thirty-nine filter wells at Pulta are examined to find out efficiency in filtration of the individual filter beds by the enumeration of the contained bacteria.

(3) The filtered water collected from the different reservoirs in the city are examined for the total number of bacteria contained in the water and for the presence of the bacilli of the colon group and of pathogenic organisms such as *Bacillus enteritidis sporogenes*, comma bacillus, and *B. typhosus*.

Bacteriological examination of the Hooghly River water at the Pulta intake and at the several bathing-ghats in the city has lately been systematic-

ally carried on. The figures so far obtained are not large enough to base any definite conclusions. But it is observable that the water of the River Hooghly is subject to sudden and wide fluctuations as regards its number of bacterial flora; the latest examinations showing variations in bacterial counts from 2,000 to 50,000 or more per cubic centimetre. It might be mentioned that the number of bacteria in the river water depend on many factors, such as the season of the year, the state of the tides, temperature of the water, agitation of the surface water, accidental presence of fæcal and decomposing organic matter, and the presence or absence of surface washing and of sewage. The river water is extremely liable to accidental pollution of various kinds and the bacterial examination to be of any value must be carried on for longer periods and under diverse conditions.

As local outbreaks of cholera take place owing to infection of tanks which abound so largely in the suburban area, it is thought desirable to find out some disinfectant which is efficacious as well as cheap for disinfecting such tanks. Experiments were undertaken with this view with ferrous sulphate.

In each experiment 100 c.c. of distilled water was taken and sterilized after addition of a few cubic centimetres of ordinary bouillon. This was inseminated with twenty-four hours' agar growth of comma bacilli.

Conclusion.

Ferrous sulphate in the strength of 0.1 gr. per gallon is not effective in killing vibrios of cholera in twenty-four hours. As iron, when present to the extent of 0.2 gr. to the gallon, will impart a chalybeate taste to the water, no further experiment was undertaken in strengths higher than those mentioned. The experiments do not prove that ferrous sulphate is useless for the purification of tank waters, but indicate that stronger solutions are probably required for certain specific organisms. In connection with notices to fill up tanks and wells twenty samples of water from such sources were examined during the year.

Other Bacteriological Examinations.—201 samples of milk were examined for the number of bacteria present, which varied between 25,000 and 576,000,000 per cubic centimetre. The lower figures were obtained in cases of cows that were cleanly housed and milked.

One hundred and seventy-five samples of water were examined for the presence of cholera vibrio, in none of these samples were comma bacilli detected.

Fourteen specimens of blood were examined; ten for suspected typhoid, by Widal's test, of which three gave positive reaction and four specimens collected from cases of epidemic dropsy were examined for the percentage of hæmoglobin and for leucocyte counts. The hæmoglobin was found to have diminished 50 per cent. and the polymorphonuclear cells 20 per cent.

Five specimens of sputum were examined, in three tubercle bacilli were detected. Of eight samples of meat examined, cysticerci were found in one, ecchinococci in one, and sarcosporidia in two. Fourteen samples of a miscellaneous nature were also examined.

Analyses of Foodstuffs.—The number of samples of foodstuffs analysed during the year was considerably larger than those of 1908. The total number was 1,661, as against 1,161, an increase of nearly 43 per cent. The increase was mainly due to a large number of milk samples sent to the laboratory by the special milk inspector and partly to special examination of samples of mustard oil for the supposed admixture of mineral oil. The percentage of adulteration detected was also higher than that of the previous year, being 63 per cent., as against 59 per cent. in 1908.

Samples of mustard oil collected from the mills and grocers' shops from different parts of the town were examined for the presence of mineral oil. In not a single sample was mineral oil detected.

The amount of adulteration in the several articles varied greatly.

As to the presence of nitrites in samples of aerated waters several samples of the ingredients for the preparation of CO_2 (carbon dioxide) used by the manufacturers were examined to account for the presence of nitrites found. As both the salts and the water used for their manufacture were found free from nitrites, it is believed that the impure acid containing nitrites may account for its presence. Impure water at times may also be the cause of it.

The *rôle* which curdled milk (*dhoi*) plays in the various processes of digestion, and the great value which the presence of lactic acid and lactic-acid bacilli exercise in preventing undesirable fermentation in the intestinal tract, have led us to examine the acid value of this article of diet so largely used by the people of this country. [Dhoi used is of two kinds, one sugared, the other not sugared, and it is usually consumed within thirty-six hours of its preparation.]

According to Professor Kitasato, 0.3 per cent. of lactic acid kills comma bacilli in five hours. As *dhoi* is largely used by the people as an article of food in all festivities and daily by many, it is assuring that *dhoi*, as sold in the bazaar, is free from all risk of causing cholera. The addition of sugar previous to curdling does not materially affect the amount of lactic acid produced, but this addition simply masks the acidity and makes the *dhoi* palatable.

Special attention has been given to the examination of all foodstuffs. More samples have been taken, a large number of prosecutions have been instituted, and more dealers have been convicted. Milk, ghee and mustard oil have been particularly inspected and very much larger quantities have been destroyed. The sweatmeat shops have been under the new by-laws for the whole year, and much improvement is noticeable. Bad ghee is often used and 258 maunds of bad sweets were destroyed. It is satisfactory to note the excellent quality of most of the foodstuffs sold in the New Market.

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A new stall for the sale of pure mustard oil has been started and the milk sold has been found good and unadulterated. Hundreds of maunds of rice damaged in the river and rendered unfit for human consumption have been destroyed, as instances have occurred of the damaged rice being dried in the sun and afterwards sold to the poor, or else ostensibly sold for the feeding of pigs, but afterwards dried and distributed in the bazaars.

The meat supply of the city is now much better protected than formerly, but still much remains to be done. The difficulties of complete supervision are very great as the meat supply comes from various sources.

Since the last report an additional municipal slaughterhouse (Hindu) has been opened at 119, Upper Chitpur Road, and another municipal slaughterhouse (also for Hindus) is under construction in Hazra Road, Bhowanipore. Two private slaughterhouses in Upper Chitpore Road have been closed and there now only remain the private Hindu slaughterhouse in College Street and the Jewish slaughterhouse in Portuguese Church Street. There is no necessity for the Hindu slaughterhouse in College Street, and it should be closed. The Jewish slaughterhouse provides solely for the Jewish community and the slaughtering is small in amount. Moreover, exceptional precautions are exercised by this community with regard to their meat supply. If accommodation could be arranged for it in the Halliday Street extension it would be advisable to transfer even this small business. In that event all the slaughterhouses would be under municipal control—a consummation I have been trying for ever since my appointment.

The inspection of meat at the several slaughterhouses before issue is supplemented by the regular inspection of meat in the markets and shops by the food and meat-shop inspectors. Very little diseased meat is now exposed for sale, but stale and decomposed meat is passed off by unscrupulous dealers to ignorant customers and is occasionally complained of.

The pig slaughterhouse was opened in 1903 and the returns have averaged 13,000—14,000 animals per annum. The Upper Chitpore Road slaughterhouse was only opened in September, 1909, so that the above figures may be taken as that of three months' work. The returns from the private slaughterhouses are very doubtful and there is no means of checking them. The large number of animals slaughtered at Sonadanga is sufficient of itself to indicate the advisability of establishing a municipal slaughterhouse in this district. The fees charged for killing at Sonadanga are rather less than those ruling at Tangra.

Considerations with regard to the Meat Supply.

The inspection of animals preparatory to slaughter is insufficient and unsatisfactory. I have previously, in a note to the Chairman, put forward a scheme for improvement in this direction, and for a veterinary department of the Corporation.

The inspection of meat before leaving the slaughterhouse is similarly insufficient and unsatisfactory, but I do not think that the present staff can do more.

At Tangra, enormous quantities have to be dealt with; at the pig slaughterhouse the carcases are mostly removed whole; at Halliday Street there is only a clerk, and at Sonadanga only a sort of caretaker. The private slaughterhouses can only be inspected irregularly.

The classification of meat is of no value in a health point of view, nor is it, in my opinion, in the interests of the consumer. All meat issuing from the slaughterhouses is presumed to be fit for consumption. The marking of first, second or third class can only indicate in a very arbitrary manner the condition of the flesh, so far as the growth and development of the animal, and the sufficiency or otherwise of its recent supply of food, are concerned. Such marking, moreover, is liable to error, and cannot be standardized for the several slaughterhouses. This marking being erratic, is taken full advantage of by the butchers and khansamas. I know of no place other than Calcutta where the meat is so classified, purchasers in all other places having to rely upon their own judgment.

The marking of goat and buffalo flesh is a different matter entirely. This is in the nature of a protection of the consumer against the frauds of the butchers, the flesh of the inferior animal being substituted for the more prized one in each case—goat for mutton and lamb and buffalo meat for beef. Though all may be in good condition and fit for consumption, the substitution is a fraud.

The disposal of condemned meat presents no difficulty. All officers concerned have had instruction to render all condemned meat uneatable by the use of a strong disinfectant.

The Kidderpore Municipal Dispensary.

The new cases numbered 5,011 as compared with 4,952 in the previous year, the patients coming from surrounding parts as follows:—

From Ward 25	1,591	Cases.
,, ,, 24	2,985	,,
,, ,, 23	26	,,
,, ,, 22	30	,,
,, ,, 18	193	,,
Other Places	186	,,
	5,011	

Of these patients, 161 were classed as Eurasians, 2,829 as Mohammedans, 1,901 as Hindus and 120 as belonging to "other classes."

Fevers of different kinds, worms, diseases of the digestive system and skin diseases seem to be the chief complaints of those attending.

The total number of patients treated was 18,419, and the average daily attendance was 51.

Five hundred and ninety minor surgical operations were performed. The amount of work done was about the average of the last few years.

A Committee has recently been appointed consisting of the members of the District IV Committee. This Committee will inquire into the work done at this Dispensary, whether it shall be removed from the present premises (4, Pipe Road), and whether a larger institution should be established with a few beds for indoor patients.

Pulta Water Works Dispensary.

The year was a fairly healthy one.

2,126 patients were attended, and there was no death. Malarial feverish attacks, respiratory complaints, and skin diseases formed the bulk of the cases. Diarrhœal attacks were few.

Requirements.

It would be easy to make out a long list of reforms and of new institutions. Those that seem desirable to be established at an early date are as follows:—

Slaughterhouses.—(*a*) A small Mohammedan slaughterhouse for sheep and goats near Sham Bazar. (*b*) A general slaughterhouse for cattle, sheep and goats at Kidderpore.

Vaccination Stations.—(*a*) A new pukka built station in a central situation for the Fringe Area. (*b*) Ornamental Pavilion (easily moveable if required) stations in the corner of Beadon Square, Mirzapore Square, and Wellington Square.

Dhobikhanas.—Additional dhobikhanas are called for in Entally, Russa Road, South, and Kidderpore.

Municipal Cowsheds are urgently wanted in the Fringe Area, Entally and Bhowanipur.

Municipal Markets.—These might be profitably established in the Fringe Area, Entally, Bhowanipur and Kidderpur, in addition to the proposal for a market in the central area of the northern half of the city.

Cold Store.—This is badly wanted, as with the closing of the Linde Company Store rooms there is now nothing of the kind in the city.

Model Dwellings for the Poor.—The present proposals are merely an experiment, and will accommodate only a few hundred people. Other dwellings might well be established for Municipal employees. Quarters might profitably be found for the dhobies renting stones in the Municipal dhobikhanas. Also quarters might be profitably provided for the pig butchers in and around Tangra.

Filtered Water Supply to Huts.—In consequence of the inconvenience attached to the necessity of fetching water from the nearest public road, people in bustees resort to foul wells and tanks for their supply of water. This is dangerous, and offers difficulties in filling up these foul wells and tanks. I do not see why filtered water stand-posts should not be permitted in the passages of a bustee, and also where the structural conditions are suitable to certain individual huts.

Automatic Flushing for Privies.—In consequence of the dirty habits of the coolie class and their inability to use the public latrines, it is very desirable that all latrines, whether public or private, which are used by large numbers of this class should be provided with automatic flushing apparatus. I understand that there is at present some difficulty with regard to the supply of unfiltered water. This should be got over, as the necessity for this method of flushing privies is very urgent.

Wandering Cattle.—There are certain important thoroughfares into which cows are turned out daily, the animals being kept during the night in sheds up bye streets. The annoyance caused by the obstruction of these animals on the footpath is one evil, but the practice is to crowd the animals very closely in sheds at night. Moreover, the messes made by the animals on the public footpaths constitute a nuisance. Harrison Road and Chitpore Road seem to be specially selected for these wanderers. I have more than once reported on this nuisance, but it rests with the police to remedy it.

The Staff.—There have been numerous changes during the year, and changes are not generally favourable to efficiency and rapidity of work. The decision to raise the status of the District Health Officers for Districts I and II resulted in the appointment of Drs. Hossack and Crake, but Dr. Hossack has recently left the Corporation, and the General Committee have deferred filling up the vacancy. Dr. Maloney has more than once had to be taken from the Plague Department to occupy acting appointments. Several changes have also been made amongst the sanitary inspectors, these being especially unfavourable for continuity of work in their respective circles, but the majority of these officers have shown much improvement. The vaccination staff, during the epidemic, did well, and a few of the vaccinators distinguished themselves by their energy and by a large amount of successful vaccinations, but the death of the superintendent at the Vaccine Depôt in the autumn gave rise to many difficulties for a short period.

The clerical staffs in all the offices were found more to do, and have done the extra work with success. I have already spoken of the work of the female sanitary inspector, and can only add here that she has shown herself, in my opinion, well fitted for the particular duties. The work of the midwives is still in an experimental stage, and the results so far are not striking. The removal of the two night clerks (Plague Department) from Nimtolla to the Head Office has resulted in the earlier distribution of the death lists to the districts, with consequently more prompt inquiries into the causes of deaths and the disinfection of infected houses. The inquiries into the causes of deaths and the resultant correction of the statistics of the city is one of several things for which the Corporation have got the credit, while the Plague Department has been doing the work. The food inspectors have done better, but they are greatly handicapped by the law.

The registration of births and deaths has distinctly improved, but better results ought to be obtained with regard to births. Not much can be expected, however, so long as the pay of the sub-registrars is only Rs. 15 a month. The disin-

fecting inspectors have done well, but they are nearly all old hands and have got thoroughly accustomed to their duties.

On the whole, I think, it must be admitted that not only has more work been done, but that it has been better done, and I believe that a higher standard of public duty is steadily growing up amongst all ranks.

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LOCAL SANITARY DEPARTMENT, HEALTH OFFICER'S REPORT FOR THE YEAR 127.

(April 1, 1908, to March 31, 1909.)

By H. CAMPBELL HIGHET, M.D., D.P.H.

Medical Officer of Health.

Ten years ago I had the honour of presenting the first of these Annual Reports of the Medical Officer of Health.

Since then such considerable developments have taken place in the department that it might be of some interest to glance at the work of the past decade.

On April 1, 1899, we find that "the staff at the end of the year consists of the Medical Officer, the Chief Sanitary Inspector, an Assistant Sanitary Inspector, and six coolies." To-day, the staff consists of the Medical Officer of Health and two Assistants, one Veterinary Surgeon, one Quarantine Inspector, one Chief Sanitary Inspector, five second-grade Sanitary Inspectors, ten third-grade Sanitary Inspectors, three clerks, and 150 coolies regularly at work.

In 1899, sixty-seven public latrines were in use, but all were wooden structures of a temporary nature. Many of these have been replaced by permanent brick and cement or iron and cement latrines, which naturally can be more readily kept clean.

The number of dust-bins has been more than doubled, and a large staff is now employed daily in removing ordinary house refuse.

During the past ten years the work of the department has been devoted more especially to the area within the city walls, as the Sanitary Decree of R.S. 116 gives it no power beyond these limits, and within these over Siamese subjects only. Much has been done to put the City proper into a better sanitary condition.

Extensive areas of marshy ground have been filled up, all old collections of refuse have been disposed of, hundreds of insanitary houses have been demolished, and in their place substantial brick buildings have been erected. Many new streets have been opened up throughout the city, all of a good breadth, and as trees have been planted along either side of most of these, the general appearance of the place has been greatly improved.

Amongst other developments may be mentioned the opening, on September 1, 1900, of the Government Cattle Sheds and Public Abattoirs at Bangkolem, at a cost of Tcls. 100,000. Further additions have been made at Bangkolem in the shape of a new shed for the purpose of quarantining sick or suspected animals. Another new shed has been built for the accommodation of cattle destined for slaughter. The two original sheds have been thoroughly renovated, iron mangers have been put in to replace the old wooden mangers for the cattle fodder, and the floors have been relaid with glazed non-absorbent bricks.

A further new departure was the placing of sheep under medical inspection and the erection of a special abattoir for the slaughter of these in 1907.

The system by which the dead meat was transported from the abattoirs to the butchers' shops has also been reorganized. Arrangements were made with the Siam Electricity Co., and special dead meat cars were made to our design, and sidings were laid into the abattoirs and in front of the butchers' shops in the Bangrak district.

The meat is now carried in a cleanly fashion, and not as before in a miscellaneous collection of filthy wagons, hand-carts, and even rickshas.

This is probably the only city in the world in which the dead meat is transported in this fashion, straight from the abattoirs to the butchers' shops, and the remarkable point about it is that the change has paid every one concerned.

At the commencement of the decade under review there was no permanent quarantine station, but ships were inspected at Paknam during the north-east monsoon, and at the island of Koh Phai during the south-west monsoon, as occasion required. This was the cause of great confusion and inconveni-

ence, and as upon one occasion quarantine against Singapore was declared during the north-east monsoon, when it is dangerous for ships to lie at anchor at Koh Phai, it was decided to establish a permanent quarantine station. The nautical advisers to the Harbour Department were therefore asked to select a suitable site, the requirements being that anchorage should be deep enough and safe enough for ships to enter and lie at anchor during all monsoons. The island of Koh Phra was held to be the best site for this purpose, and in January, 1905, the quarantine station was established on this island as a permanent institution. As the existing charts of the anchorage and adjacent waters were not reliable, a detailed survey was made by the Naval Department, and an excellent chart was published last year. Since the selection of Koh Phra as a quarantine station larger steamers have commenced to call for cargo at Koh-Si-Chang and at Anghin.

As these ships draw so much water that it would at times be unsafe for them to enter the usual anchorage at Koh Phra, a new system has been adopted, as described in this year's report, whereby they will be boarded at the outer anchorage.

On the advent of plague in Bangkok in December, 1904, a commencement was at last made on the erection of a hospital for infectious diseases. The site chosen was near the mouth of Klong Sarn, and there a hospital, consisting of five separate pavilions, along with the usual administrative buildings, was erected. On December 4, 1905, His Majesty the King inspected the buildings, and most graciously approved of the hospital being opened for the reception of patients.

Previous to the opening of the hospital we had no proper means of dealing with cases of infectious disease.

Further work was thrown upon the department in January, 1906, when the management and control of the asylum was transferred from the Education Department. In April, 1906, a like transfer was made of Bangrak, Burapah, and Samsen hospitals. Unfortunately Burapah Hospital was completely destroyed by fire in December, 1906, and has not been rebuilt.

In September, 1901, a meteorological station was established for the purpose of recording the daily temperature and rainfall. As no such records were available, except those of Dr. James Campbell, taken over thirty-five years ago, these daily recordings have proved to be valuable data.

In 1903 a chemical and bacteriological laboratory was established in the office of the medical officer of health at the Local Government Offices. The work done in this laboratory has steadily increased to such a degree that it was found necessary to erect a separate building for the purpose, and entry was made in March of this year. The new laboratory consists of a chemical-room, a bacteriological-room, a store-room, and an office, and is bound to prove of great use in the work of the department.

Such is a brief summary of the more important developments in this department during the past ten years. Much yet remains to be done, but at least a start has been made.

Port Health Department.

As in former years, medical inspection of all ships arriving from Hongkong or from any port in China has been carried out at Koh Phra. The total number of ships examined during the year amounted to 171, being 23 less than the previous year, while 60,525 passengers were examined, being 18,217 less than in the previous year.

Of the passengers, 455 were landed at the station. Owing to a death from plague having occurred on the s.s. *Phranang* during her voyage from Swatow, all the passengers to the number of 445 were landed and detained under observation for five days. No further case of plague arose, and after disinfection of the passengers' effects all were discharged. Of the other ten passengers landed, four suffered from simple fever, four from small-pox, one from pneumonia, and one from mumps. The four cases of small-pox and one of mumps were landed from the torpedo flotilla, which was then manœuvring in the gulf.

Four deaths took place, three from small-pox and one from pneumonia.

The telegraph office erected at Sataheep for the use of the station continues to be of great service.

The new chart of the quarantine anchorage and adjacent waters, prepared by the Naval Department, has now been published, and ought to be of great assistance to masters of vessels calling at Koh Phra.

Owing to complaints that many of the larger vessels calling at the station draw so much water that it would be dangerous for them to proceed to the inner anchorage, a special arrangement is being made for these. A flag-staff and signalman's house are being erected near the rock upon which the beacon light now stands. Here a permanent look-out will be maintained, and upon a ship signalling that it is drawing too much water to enter the inner anchorage, a return signal will be displayed ordering the ships to anchor outside, and there await the arrival of the quarantine officer.

To enable the doctor to proceed to the outer anchorage with safety, a sea-going launch has been procured and will be stationed at Koh Phra.

Abattoirs and Cattle Export.

Report of the Veterinary Surgeon, Mr. H. Leonard, M.R.C.V.S.:—

During the year only one case of contagious disease—anthrax—occurred in the sheds. The infected animal—a calf—succumbed to the disease on August 16. Stringent precautions were taken, and all cattle likely to be in contact with the diseased animal were quarantined for three weeks. No other case occurred. Twenty-five whole carcases, fifty-three quarters, and 620 parts or organs were destroyed as unfit for human consumption as food; the principle cause for destruction being tuberculosis.

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(continued).

Three animals suffering from broken limbs were brought into the sheds. As the injuries had already been inflicted several hours, and as in consequence inflammatory changes had set in and had rendered the flesh unfit for food, these three animals were at once destroyed. Eleven cattle died from non-contagious disease during the year. Two sheep died from exhaustion soon after being landed, owing to rough treatment received on board ship during transit from Hongkong. Two sheep died in September from poisoning. I made a *post-mortem* examination, and came to the conclusion that the sheep had eaten a poisonous herb, which had set up a fatal inflammation of the stomach.

11,041 bullocks, 15 calves, and 603 sheep were slaughtered at the abattoirs during the year, being 600 less than the previous year. 447 cattle were exported during the year, a deficit of 2,448 as compared with the previous year.

The net revenue for the year was Tcls. 30,447, 20 atts., a deficit of Tcls. 2,786.20 compared with the previous year.

There has been a great scarcity of cattle in the sheds during the year, the dealers and butchers complaining that it becomes harder every year to buy cattle up country; they also complain of a delay in getting the certificates from the Amphurs, without which certificates no cattle are allowed to be removed.

The scarcity of cattle nowadays, referred to by Mr. Leonard, is a matter worthy of the attention of the Government.

The reasons for this lessening of the numbers of cattle in the country are threefold.

The first is the prolonged drain of many years' export to Singapore, a steady decline having taken place from year to year, and not only have the numbers fallen, but the quality of the cattle has greatly deteriorated. One very rarely sees nowadays the fine big draft bullocks which were formerly so common in the sheds and for which such good prices were obtained in Singapore.

The second reason for the dearth in cattle, however, is a more potent one, and is the enormous death-rate which annually takes place from various forms of disease. Rinderpest, anthrax, and other epidemic diseases decimate the herds from time to time, and yet no efficient steps have been taken to stamp out these causes of death.

A third factor in this deterioration of the herds is the "in and in" breeding and of the want of importation of new stock.

The erection of the incinerator has been commenced and, when finished, it will at last be possible to dispose of condemned meat in a rapid and sanitary fashion.

Great assistance continues to be rendered by the police in the inspection of meat exposed for sale in the markets in order to ensure that only officially stamped beef is supplied to the public.

Hospitals.

The following hospitals are under the care of this department: The Police, Bangrak, and Samsen Hospitals, the Hospital for Infectious Diseases, and the Lunatic Asylum.

During the year a total of 6,294 were treated in the hospitals; of these 434 died, giving a general death-rate of 6.8 per cent. This shows an increase of 1,807 patients as compared with the previous year. On comparing the figures for the different diseases treated it will be seen that this increase of patients has been a general one, and is not due to the presence of any severe epidemic. There were 7 more cases of plague, 93 of smallpox, and 180 of Beri Beri; while a reduction of 37 cases of diarrhœa and 105 of cholera are noted. All the hospitals, with the exception of Bangrak Hospital, show an increase of in-patients. It is gratifying to see that the hospitals are becoming more popular with the inhabitants of Bangkok.

Police Hospital.

Doctor Fyshe is in charge of this institution, where he is assisted by Chief Apothecary Mr. E. A. Bryan and Nai Chan, Assistant Apothecary. The total under treatment amounted to 4,803. 2,962 out-patients were attended to; the daily average number of in-patients was 41.9; 79 deaths occurred; and 157 major operations requiring chloroform were performed. In the public mortuary attached to the hospital, 142 autopsies were conducted, and 40 inspections of dead bodies were made. Chemical analyses and microscopical examinations amounted to 204.

This hospital is rapidly gaining a reputation amongst the poorer Siamese and Chinese as a hospital for the treatment of wounds. It is in an excellent central site, and might well be extended to form the "Jubilee Hospital," the erection of which has been under consideration for some time.

Bangrak Hospital.

Under the care of Dr. T. Heyward Hays this hospital continues to be of great use to the inhabitants of the southern end of the city, more especially to the workers in the various docks, mills, and shipping. Besides the 336 in-patients treated, 12,182 visits were paid by out-patients applying for medicines or to have their wounds dressed. Operations under chloroform totalled 104, while 203 operations were performed without chloroform.

Samsen Hospital.

Lhuang Pet is the resident surgeon here. The prevailing diseases treated in this Hospital are non surgical, but many accidents in the neighbourhood are taken here, as the other hospitals are some miles away. This is a favourite hospital for vaccinations with the people of the northern end of the city, and beyond it on both sides of the river, 1,876 vaccinations having been performed this year. As a hospital, the buildings must be looked upon as a

temporary makeshift only. At present the work is carried on in a number of shop houses quite unsuited for the purposes of a hospital. When the proposed central hospital has been built, it is intended to turn Samsen Hospital into a Dispensary and Emergency Hospital only.

THE HOSPITAL FOR INFECTIOUS DISEASES.

It is difficult to imagine what was done with cases of infectious disease before the opening of this Hospital. Previous to this year, its great utility for the reception of Plague cases was demonstrated, but this year, when small-pox was epidemic, the benefit of such an institution has been invaluable.

Dr. Carthew reports as follows:—

"The total number of patients treated during the past year shows again a marked increase over former years, due to the Hospital becoming popular with the general public. The number of patients sent over on the order of the Medical Officer of Health remains about the same as last year, and the increase in the total number is due to those patients who have themselves sought treatment.

"This is especially noticeable in the case of beri-beri patients, who daily apply for admittance and are willing to submit to hospital rules and discipline, a thing contrary to their custom and inclination, as they are there deprived for the time being of the society of relations and friends.

"The mortality from this disease has decreased nearly 4 per cent., due to the treatment with parboiled rice instead of milled rice.

"Cholera shows a very noticeable decrease, *viz.*, 58 less than last year, probably accounted for by the abnormal rainfall and the absence of salt in the river water. The mortality is practically the same as for last year. The Chinese have a bad habit of bringing their relatives when in a dying condition from cholera, dumping them at the Hospital gate and then running away, without giving any name, &c., so that, in the case of the patient's death, his friends cannot be traced and no information can be elicited as to the district of the city from which the case came.

"Plague has remained stationary, the cases being few and scattered throughout the year. The mortality, however, is much higher, viz., 95.6 per cent., as compared with 47.5 per cent. for last year.

"A very severe epidemic of small-pox occurred in the latter part of this year throughout Bangkok, and though only a small portion of those affected were treated in this Hospital, still these were unselected cases and well show the type of disease prevalent. The disease was of a very virulent type, with a high death-rate, *viz.*, 52.6 per cent. I have never before seen such severe cases, the deformity in those who recovered being terrible, notwithstanding all the care taken to prevent this. Some remain paralyzed, some are blind, and all are pitted and pocked beyond recognition. None of these cases had been vaccinated, and such a type of small-pox is practically never seen in Europe, where vaccination is universal.

"The remaining patients were composed of cases under observation, unclassified fevers, &c., and account for but a small portion of those admitted.

"It will be seen that this Hospital, which originally was intended for the isolation of plague cases only, has fulfilled a far more useful purpose as a General Infectious Diseases Hospital; for not only are the patients sure of the necessary nursing and attention which they might not receive in their own homes—for no one is anxious to nurse an infectious case—but they are also individually prevented from spreading the disease to other people and districts.

"A commodious salar has been erected behind the kitchen, in which the convalescent patients may take their food.

"The staff ought to be increased. An assistant to Moh Mun is urgently required, and also several more attendants, for though the present number was sufficient when the patients were few and only of one class, *viz.*, plague, now that many diseases are treated, a much larger staff is required. It would be of great benefit if the banking-up of the klong were completed, as the earth keeps on falling in and filling up the klong, and there still remains about one-third to be done."

THE ASYLUM FOR THE INSANE.

This is the most unsatisfactory of all the institutions under my charge. As I reported last year, the place is totally unfitted for its purpose, and is steadily falling to pieces. Doctor Carthew, who is in charge, assisted by Khoon Adool, the resident physician, puts the matter tersely and well in his report to me upon the working of the Asylum for the year. He writes:—

"The report for the year 126 was written in a very hopeful tone, prospects of a new asylum and an improvement in the condition of the lunatics being mentioned. These prospects have not been verified, the changes mentioned seem to be very remote, and the Asylum stands now in a worse condition than it did this time last year." After describing the many defects in the buildings, &c., Doctor Carthew continues as follows:—

"The only hopeful feature I have to report is the change that treatment with parboiled rice has produced. It was started on February 12, and since that date there has not been a single further case of beri-beri, and there have only been four deaths amongst the old cases, whilst previous to this a daily death was the usual thing. All the other old cases of beri-beri have improved marvellously, ten being discharged cured.

"The number of deaths being so much lessened, the asylum is now becoming overcrowded, accommodation is scarce; so patients have to either be refused admittance or be discharged in a very slightly improved condition. Apart from mere segregation the proper treatment of lunatics cannot be carried out until further accommodation is provided.

"The mortality for the past year has been 28.8 per cent., which is three times greater than it should be under the ordinary conditions of a

lunatic asylum in the East. Again the great majority of deaths is due to beri-beri. On the other hand, if they do not die from beri-beri, what is to become of them? for there is no room for any increased number in the present building."

I shall discuss in detail when dealing with beri-beri, the remarkable effects produced by the substitution of parboiled rice for ordinary steam-milled rice, but, in passing, emphasis should be laid upon what Doctor Carthew has said in the last sentence of his report. Since taking over this institution, we found that the death-rate was so high that the daily number of inmates never reached a higher figure than about 90 to 100. Beri-beri was here the check upon the increase of population. Now that the old cases have either died, recovered or been discharged, the daily average of resident patients has mounted to as high a figure as 140. This, in an institution, in which, owing to many of the rooms falling into ruin, the accommodation has steadily become reduced, can mean only one of two things—

The asylum will either become dangerously overcrowded and the inmates' health will suffer, or we shall be forced to refuse the admission of more patients. The latter is, of course, the only alternative until vacancies have occurred owing to the discharge of cases of recovery or until a new asylum has been provided.

Epidemic Diseases.

As I have already pointed out in my introductory remarks, our power of combating epidemic diseases is still greatly hampered by the want of a death registration and of an Infectious Diseases Act; I trust that the latter will soon be put into force.

Plague.—During the past year fifty-one cases have come to our notice as compared with thirty-nine for the previous year and eighty-eight for the year before that.

The behaviour of this disease is the same this year as in former years. The rats in a certain district become infected and begin to die of plague. Some cases develop and the department gets to know of them, not always at the commencement of the outbreak, but more often after several deaths have occurred. The usual sanitary measures are then taken, houses are cleaned out and disinfected, the sick are removed to the hospital, and soon no more cases develop in the affected area.

Why we have so few cases of plague in Bangkok one cannot say. There is every encouragement for the disease to spread and yet it would seem that the measures taken by the department have been invariably successful. There is no doubt that much is due to the fact that when plague first broke out, His Majesty the King gave the Health Department practically a "free hand" in carrying out measures of prevention. Such power continues to rest with the department and the result has been that we have very rarely had any trouble from the ordinary citizen of Bangkok. A case in point is the outbreak in Wat Lieb Street last year. In May, information was given by the police that suspicious deaths had taken place in this street. On investigating the matter, it was found that rats were also dying in several of the houses. The infected premises were disinfected and cleansed and many dead rats were found and burned. The whole district was put under medical inspection, and morning and evening every person in the street was seen by an inspector. As further cases broke out here and there in this street, an order was issued that every house in the street must be cleaned, disinfected and limewashed. The street was closed to vehicular traffic to allow the people to put their effects on the roadway, and every assistance was given in the way of labour, disinfectants and lime-wash. The inhabitants did their best to help, and at the end of a week every house was inspected and passed as clean. Since this thorough cleansing no fresh case has occurred in this district, although ten cases were reported during May and June.

Districts in which Plague Cases occurred during 127.

District	No. of Cases
Bang Khoon Phrome	1
Wat Chanasongkram	1
Bangkok Noi	1
Ta Chang Wang Luang	3
Samranrat	10
Tatien	4
Ban Moh or Wat Lieb district	11
Pratoo Samyot	4
Wat Sam Plume	2
Samphantawongse	3
Pomprab	3
Klong Somdej Chow Phya Ong Noi	4
Talat Plu	1
Residence unknown	3
Total	51

It is strange how plague seems to creep from district to district and then die out. In the previous year Klong Ban Somdej Chow Phya Ong Noi and Wat Chanasongkram were the areas chiefly affected. During the past year, Klong Ban Somdej Chow Phya Ong Noi accounted for four cases, but these occurred during the early part of the year. Great changes for the better have taken place in this district; a new market has been erected, old insanitary houses have been pulled down and new houses built.

As already stated, Wat Lieb district was infected during the early part of the year. During November, December and January, Wat Suthat and Bamrung Muang Street accounted for ten cases. The other area specially infected was Wat Chetupon (often known as Wat Poh). Here during December and January four deaths occurred amongst the priests of this wat. Extensive cleansing operations have been carried out in this wat, and since February 10 no further case has been reported.

One common factor in all outbreaks of plague in Bangkok is the filthy condition of the district affected. This, in conjunction with overcrowding and the presence of old-fashioned, dark and ill-ventilated Siamese houses—often with earthen floors—seems to conduce to plague. In fact, it may be truly said that the advent of plague in a district is an indication that its sanitary condition is in a bad way. Hence I have come to look upon plague as a blessing in disguise and as my most

efficient sanitary inspector. The only Royal Road to its prevention is sanitation. Clean, go on cleaning and keep clean, and you will get rid of plague, as has been the case in Europe for many centuries.

Small-pox and Vaccination.

Siam is no exception to the general experience that where compulsory vaccination has not been enforced for years, small-pox is not only endemic, but from time to time takes on an epidemic form. This year the disease has been epidemic and of 379 known cases, 211 persons had died, giving a death-rate of 55.9 per cent.

As a rule this disease manifests itself during the cooler months of the year, *i.e.*, December and January, and dies away as the hot season approaches. This year, however, cases of small-pox are known to have occurred as early as June.

Monthly Abstract of Small-pox Cases during 127.

Month	Cases
June	2
July	1
August	2
September	3
October	2
November	40
December	50
January	116
February	100
March	34
Total	350

In the absence of definite data, it is of course impossible to say how many cases there were, but it is quite evident to me that the above-mentioned total of 379 comes far short of the mark. In order to remedy this state of affairs, I have drafted an Act for compulsory notification of infectious diseases and hope to see it put into force at an early date. Naturally, no comparison can be made between this year's epidemic and those of former years as no records are available. On questioning one of Bangkok's oldest residents on this matter I was told that small-pox was always present, more or less, in Bangkok during the cool season, and that it was difficult to say when such a severe epidemic as this last had raged in Siam. With regard to the late epidemic it may be said that the type of the disease was of a very severe character. Many of the cases were of the malignant hæmorrhagic character in which the eruption appeared early in the form of blood spots, and death took place within the first few days. Two Europeans died from this form of the disease, while several others suffered from a milder type. Naturally, as might be expected, where vaccination had already been performed even in childhood, adults suffered from this mild form only. One very interesting case was that of a Siamese who worked as a coolie in the Royal Irrigation Department. He and another coolie lived together in a small boat, and on his friend dying of malignant small-pox, he had himself vaccinated at one of our public vaccination stations. Ten days later he was admitted to the Hospital for Infectious Diseases suffering from severe confluent small-pox. Vaccination had taken extremely well, the marks were drying up, and it was hoped that the patient would survive. He had not been previously vaccinated and had resorted to this method of protection too late, and although he made a splendid fight, he eventually succumbed to the disease.

The only other fatal case amongst those previously vaccinated was that of a child of 4 years of age, sent in from the Bombay Burmah Company's mills, where there were several cases of a most malignant type.

Preventive Measures against Small-pox.

Three methods of prevention are known to Science. These are inoculation, vaccination and segregation.

Inoculation was a very ancient practice of Africa, Persia and China. The method consisting of taking the virus of small-pox from a pustule after the commencement of the eighth day and inserting it in or beneath the skin of a person who has not previously suffered from the disease. As a rule the artificially produced disease was much less dangerous than ordinary small-pox, and it was an almost certain means of preventing a subsequent attack of the disease.

The mortality was slight, but the great danger of this method was that it perpetuated the very disease against which it was used as a preventative. In Siam, inoculation was introduced in the year 1838 A.D.

Vaccination was first introduced into Siam about the middle of January, A.D. 1840, from vaccine scabs brought by an American missionary from Boston, U.S., viâ the Cape of Good Hope. Unsuccessful attempts had been made during the previous six years, but in all cases the vaccine virus was inert on its arrival in Siam. On the arrival of the scabs in 1840, there was great difficulty at first in obtaining subjects for experiment, and but for the assistance of Somdej Ong Yai, then Prime Minister, another failure might have been recorded. This enlightened nobleman, however, placed seventy-five boys and girls—slaves—at the disposal of the missionaries, and out of a total of 450 insertions, three or four good pustules were found on the sixth day. From these vaccine was propagated and over a hundred persons were vaccinated, but at the end of three months the virus lost its efficiency.

In November, 1842, small-pox again appeared in an epidemic form, and the missionaries had great difficulties to contend with in their campaign against small-pox.

It was not until the year 1904, that the Siamese Government undertook the preparation of calf lymph in Bangkok. A vaccine laboratory was then opened at Si Kak Phya Sri by the Hospital Department, and large quantities of calf lymph were supplied to the public. It was soon found that more commodious premises were required, and the present Serum and Vaccine Laboratory was installed at Phrapratom and work was commenced there in August, 1906 (Siamese Era 125).

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(continued).

Since this date 335,175 doses of calf lymph have been issued to the public, and the benefit which has thus been conferred upon the country, and more especially upon the rising generation, is simply incalculable.

Considering the fact that vaccination was first introduced into the country by Americans, it is peculiarly appropriate that the Vaccine Laboratory at Phrapratom should have been started by an American—Doctor Paul Wooley—and that, on his retirement, he should have been replaced by another American graduate—Doctor Edwards.

In a small pamphlet on "The Blessing of Vaccination," written by J. W. McKean, M.D., Chieng Mai, and published in October, 1906, we find the following interesting references to small-pox and vaccination in the North of Siam:—

Some of the hill tribes fear this dread disease to such an extent that when it is known to have approached their locality the people block all roads of approach to their village by felling trees across the mountain paths and otherwise obstructing travel, allowing none to enter or leave the village until all danger is past. If in spite of their precautions the disease enters the village, the place is deserted at once, all the families fleeing, leaving naught but empty houses and the sick person. He is furnished with food and water and left to his fate, unless perchance some friend or relative, who has already had the small-pox, is willing to remain behind to care for the sufferer. It is said that as a reward for such a service the patient on his recovery bequeaths all his possessions to this one who was a friend in time of need. The Laos people proper, who live on the plain, do not seem to fear small-pox greatly. Indeed, I have seen mothers bringing their babies into small-pox infected houses rather hoping that the babe would contract the disease in infancy.

Forty years after Jenner's discovery, Dr. Bradley introduced vaccination in Siam, and in 1867 Dr. McGilvary, in the beginning of the work in North Siam, brought this life-saving measure to the Laos people. From that day until the present vaccination has been carried on by the missionary physicians. It has been instrumental in preserving many lives, and it continues to grow in popularity with the people.

The great difficulty in bringing vaccine, which is a very perishable substance, from either America or England has been a constant hindrance to the work. Two years ago we instituted our own vaccine laboratory, and during the past two seasons our vaccinating staff of over a hundred men have done some 17,000 successful vaccinations.

Fortunately in Siam actual opposition to vaccination is practically unknown. The usual reasons for non-vaccination are indolence, carelessness, and often actual absence of opportunity. The last reason is, however, being gradually removed by the opening of free vaccination stations throughout the country. Although people readily flock to these stations, something more should be done to encourage parents to have their children vaccinated as well as to ensure young adolescents being re-vaccinated. It is scarcely necessary to support the efficacy of vaccination nowadays, but it might be well to give a few figures. For example, during an epidemic of small-pox at Sheffield in 1887-88, 15.05 per 1,000 of *vaccinated persons* took small-pox, but 97 per 1,000 of those *not vaccinated* took the disease. Of the vaccinated persons 4.7 per 100 of those attacked died, but among the unvaccinated 31.1 per 100 died.

How are we to ensure the spread of vaccination in Siam? Much good might be done if the advice which I gave in my fifth annual report were carried out. Here is the passage:—

There is no law enforcing vaccination, but in Bangkok most of the inhabitants have their children vaccinated sooner or later. I would strongly urge, however, that vaccination should be enforced upon all the following:—

(1) Recruits entering the army, navy, or police; (2) all persons entering government civil services; (3) all children entering the public schools.

In this way a very large percentage of the male population would be got at. Greater facilities might be afforded to the women to be vaccinated themselves and to have their children vaccinated by not only providing many public vaccination stations, but also by house-to-house visitation by Government Vaccinators.

This year, when the new police conscripts were called up, opportunity was taken to vaccinate all who showed no signs of small-pox. The figures obtained from an inspection of the men are very interesting. Out of a total of 433, marks of small-pox were found upon 235 men; 156 men had been previously vaccinated and had not suffered from small-pox, while 42 had neither been vaccinated nor had they contracted small-pox.

In percentages the rates of these 433 young male adults are as follows: Had small-pox 54.27 per cent.; vaccinated and no small-pox 36.02 per cent.; neither vaccinated nor had small-pox 9.7 per cent.

If we take this lot of young adults as an average sample of the adult male population of Siam, we find that over 50 per cent. have suffered from small-pox, and, further, if we allow amongst these a death-rate of only 25 per cent., which is well under the mark, it will be seen that 12.5 males in every hundred have died of small-pox before reaching adolescence.

Segregation or isolation of the sick and quarantining of those who have been in contact with cases of the disease is the third method which has been employed. It is neither a possible nor an advisable method to attempt in this country.

Actual Methods Employed in Fighting this Epidemic of Small-pox.

Sixteen free vaccination stations were opened throughout the town—a system which was inaugurated in the previous year—and a public notice

was issued drawing attention to the establishment of these stations. In order to get at the people in the outskirts of Bangkok, arrangements were made for sending out qualified vaccinators once a week to each of the six muangs.

RECORDS OF VACCINATION R. S. 127.

Vaccinating Station	Male	Female	Total	Failures
Bangrak Hospital	754	725	1,479	9
Samsen	873	1,003	1,876	—
Infectious Diseases Hospital	50	37	87	—
Phya Pitsanoo's School	296	618	914	14
Wat Chanasongkram	122	132	254	—
Tatien Station	33	38	71	—
Wat Chakrawat	73	25	98	10
,, Mahapruet Tahram	5	9	14	—
,, Don	43	42	85	8
,, Sang Krachai	76	70	146	1
,, Phichyat	162	102	264	12
American Presbyterian Chapel (Sao Chin Cha)	197	204	401	—
American Presbyterian Chapel (Si Phya Road)	306	154	460	—
Muang Samut Prakarn	169	134	303	1
Nakon Khuan Khan	287	315	602	33
Muang Pratoomtani	759	988	1,747	—
Muang Non and Wat Thai Muang	496	835	1,331	25
,, Minburi	506	428	934	12
,, Tanyaburi	149	173	322	4
Medical Officer of Health's Office	390	63	453	1
Police Hospital	12	—	12	—
House to house vaccination	287	236	523	74
Total	6,056	6,339	12,395	204

ADDITIONAL RECORDS OF VACCINATION.

	Male	Female	Total	Failures
Chinese Hospital	1,207	1,180	2,387	Not recorded
Wang Lang Hospital	2,770	2,681	5,451	,,
Naval Department	2,898	—	2,898	28 per cent. for primary vaccination
	6,875	3,861	10,736	

Grand total	Male	Female	Total	Failures
Local Sanitary Department	6,056	6,339	12,395	204
Other sources as above	6,875	3,861	10,736	—
	12,931	10,200	23,131	204

Additional figures received from The St. Louis Hospital, too late for insertion in the Report*:—

Males	102
Females	39
Total	141

* These vaccinations were performed with lymph supplied free by the Local Sanitary Department.

In the city a house-to-house visit was paid by the inspectors, and whenever there was or had been a case of small-pox, free vaccination was not only offered to all not previously vaccinated, but revaccination was strongly urged. Removal of the sick to the hospital was permitted in many cases, and free disinfection of the infected houses was carried out by our disinfecting staff. During this house-to-house visitation, 524 persons were vaccinated who would not in all probability have been otherwise vaccinated, owing to the laziness or carelessness of the parents or of themselves. The amount of apathy and even of opposition to our attempts to help the people was in many cases very marked. This opposition has steadily lessened as our inspectors have managed to get well into touch with the people in their districts, and every year it will become less.

The total number of vaccinations performed by our own vaccinators amounted to 12,395. Of these 7,356 were performed in Bangkok and 5,039 in the outlying muangs. In addition to these the following figures have been kindly furnished to me: Royal Naval Department 2,898; Wang Lang Hospital 5,451; Chinese Hospital 2,387; total 10,736.

We have, therefore, a grand total of 23,131 vaccinations known to have been performed. If one adds to these the numbers for the Army and the vaccinations performed by private medical practitioners, which were very numerous this year, I do not think that a total of 25,000 would be an exaggerated figure for those who have undergone protection against small-pox for another ten years at least.

The lymph used entirely by this department, by the Naval Department, by Wang Lang Hospital, and in a large percentage of the remainder, was that prepared at the Government Serum Department at Phrapratom.

While on the question of lymph, I may say that, owing to complaints having been made by several people that this lymph was not good, the Minister of Education, who had control of the Vaccine Department, asked for and obtained the permission of Your Excellency to allow me to inspect and report upon the Establishment at Phrapratom. This I did in conjunction with Mr. Leonard, the Veterinary Surgeon to the Sanitary Department. Through the kindness of the Director, Doctor Edwards, and of his Chief Assistant, Mr. Redfield, we were enabled to see everything and to observe all the methods of preparation of lymph from start to finish. In our report, after making certain recommendations, we stated: "The Government has here an excellent institution, well managed and doing splendid work, but nothing short of perfection should satisfy it." Some of our recommendations have already been carried out, and the others are receiving the earnest attention of the Ministry of Interior, to which Department the Vaccine Laboratory has now been transferred.

CHOLERA.

In previous annual reports I have repeatedly laid stress upon the close relation between the condition of the river water and the presence of cholera in our midst. I have shown that if the rainfall for the year is below the average, the water in the river becomes more or less brackish in proportion to the amount of fresh water flowing down from the interior.

The rains prevail from May till November, when the normal amount of salt in the river is as low as 0.5 part per 100,000. On the cessation of the rains the volume of fresh water coming down from

up-country naturally soon begins to lessen, and in years of poor rainfall we may find that as early as January the river is so low that the reflux of sea water brings quite a large amount of salt. This was specially noted in January, 1903, when after a poor rainfall, amounting to 46.4 in., the river became so salt that at high tide on January 12 380 parts of chlorine per 100,000 were discovered by analysis. The natural result was that cholera at once broke out in an epidemic form. During the year under review we have experienced quite a phenomenal rainfall—71.36 in. as compared with 49.37 in.—a fair average for the previous year. Before the effect of the year's rain could be felt, eleven cases were reported during April, five during May and two during June. No further cases were recorded until November and December, when three cases were reported during the former month and one during the latter. January and February were free, and only two cases were reported in March—the last month of the year. This means that during the usual cholera season after the cessation of the rains, we have only had seven cases. Throughout the year, since the rains started, the chlorine in the river water has never risen above 4.6 parts. Surely, if such were required nowadays, we have here one of the best arguments in favour of the public water supply for Bangkok. When the public are no longer dependent upon the natural variations of the year's rainfall, I have no doubt that cholera will be a rarity in place of being a usual incident of the dry season. It is needless to allude to the economic gain to the country from the saving of so many lives and to commerce from the removal of quarantine restrictions at neighbouring ports.

Enteric Fever.

This disease has attained an unusual prominence this year owing to the fact that in June His Excellency Phya Intharathibordi Sriharaj Rong Muang, Vice-Minister of the Local Government, passed through a sharp attack, while Your Excellency was seriously ill from the same disease in March. Owing to the absence of notification of infectious diseases, it is impossible for me to give details as to the number of cases, but to my personal knowledge quite a large number of Europeans have suffered from enteric fever during the year. The incidence of the disease was most marked when the flood water began to disappear. As I have shown elsewhere, this is a favourite time for enteric fever to break out. Fortunately, in the majority of cases the disease has been of a mild type. Much of this mildness, however, is, in my opinion, due to the earlier recognition of the disease nowadays, and to the better nursing of the patients.

The scientific methods of diagnosis from examination of the patient's blood, as practised in the laboratory, are of invaluable assistance, and I should be glad to see private practitioners make free use for this purpose of the facilities of the laboratory, which are always gladly afforded them.

Beri-beri.

Beri-beri is a disease which is found in tropical and sub-tropical countries. It is a disease of the nerves, but whereas many nervous diseases are located in the brain and spinal cord—the central nervous system—this disease affects the peripheral nerves—the nerves of the trunk of the body and limbs. The disease may develop into dry or wet beri-beri.

In *dry beri-beri* the initial slight dropsy may disappear, and the weakness of the limbs develops into actual paralysis, so that the patient may be unable to walk or to move his arms. The muscles —perhaps swollen at the first—now waste away, and in this condition the patient remains either until he dies or until recovery begins.

If the case develops into one of *wet beri-beri*, dropsy is the most marked feature. This dropsy may be so great that the whole system becomes water-logged, and the patient may die from obstruction to the action of the heart and lungs caused by the presence of the fluid.

Palpitation, rapid action of the heart, and breathlessness are common symptoms of this form of the disease.

A third variety may be described as the *acute* or *heart form of beri-beri*. The patient has probably suffered from the dry form for some time, when for some reason or another—it may be extra exertion or hardship—the heart begins to fail, and death may occur within twenty-four hours. Quite a large number of such cases have been admitted into the police hospital, and so rapidly has death taken place that many corpses have been sent to the mortuary on suspicion of foul play being the cause of death.

The mortality from beri-beri varies greatly, but may be anything from 2 to 50 per cent. The disease tends to appear in an epidemic form.

The cause of beri-beri is a subject upon which many varied opinions have been expressed. That it is due to a living germ has been advocated by many, especially by the Dutch physicians, and it was even held to be contagious.

More stress has been laid upon the idea that it is a food disease, some believing that it is due to eating bad rice, others to eating certain kinds of fish. That food has much to do with the causation of beri-beri is proven by the results of the change of diet in the Japanese Navy. In this service the disease was a scourge until the diet was improved, when it practically died out.

In Java, in the prisons, it was found that the proportion of cases was 1 to 39 when the rice was eaten completely shelled—white rice—but only 1 in 10,000 when the grain was eaten with its skin or pericarp. Again, it has been stated that steam-milled rice gives rise to beri-beri, whereas hand-milled rice does not. This is not our experience, however, in Siam. I have seen many cases of beri-beri develop amongst people eating only hand-milled rice, and during the recent examination of conscripts for the Bangkok Police a very large

percentage of recruits were refused because of beri-beri, and yet the men had lived all their lives more or less on hand-milled rice.

Doctor Braddon, the Residency Surgeon in Negri Sembilan—Federated Malay States—showed that amongst the immigrant peoples of the Malay Peninsula, the Chinese suffer severely while only a few cases are ever seen amongst the Tamils. He believes that the disease is due to the consumption of stale white rice such as is eaten by the Chinese coolies, and that the reason for the exemption from the disease amongst Tamils is that they only eat parboiled rice. The Malays are immune, according to Braddon, because they only eat rice prepared from padi newly husked. Here is no doubt the reason why hand-milled rice is said not to cause beri-beri. If only enough to last a few days is milled at a time, it remains fresh, but if a large quantity is prepared, it soon deteriorates in the native dwellings and may then give rise to beri-beri. Braddon believes that beri-beri is due to a special fungus which probably grows upon the surface of the rice grains.

When white rice is prepared by machinery, no preliminary treatment is given to the padi and so the fungus is apparently not entirely removed. When this rice becomes stale, it is said to produce beri-beri if eaten for a certain length of time.

As the question is one of great economic importance in the Straits Settlements and the Federated Malay States owing to the great amount of sickness and the high death-rate amongst the labouring population, the British Government appointed Doctors Fraser and Stanton of the Institute for Medical Research, Kuala Lumpur, to investigate the matter. In a preliminary report entitled "An Inquiry concerning the Etiology of Beri-beri," these two medical men describe in detail a very interesting series of experiments.

In order to avoid any chance of fresh cases of beri-beri coming amongst the persons under observation, it was decided to observe a gang of 300 Javanese coolies employed in the work of road construction in a remote part of the Jelebu district in the State of Negri Sembilan. All the men were examined and found to be free from any sign of existing or recent beri-beri. They were divided into three groups, each group being stationed several miles apart along the line of the proposed new road. Party 1, subdivided into Party 1 A and 1 B, was fed upon white rice from July 1, and by October 11 seven cases of beri-beri had occurred in Party 1 A, and by October 18 five cases in Party 1 B. As the report says: "As there was apparently nothing further to be gained from a continuance of the white rice diet, it was thought that the time was suitable by a change to the parboiled rice to observe the effect of this alteration of diet upon the course of the outbreak. Accordingly parboiled rice was substituted for white rice in the diet of Party No. 1 A on October 12, and in that of Party No. 1 B on October 19. After this change no case of beri-beri occurred in either party and such cases as showed signs suspicious of beri-beri rapidly got well. This abrupt cessation of the outbreak constitutes important evidence of a causative relationship between the consumption of white rice and beri-beri."

Of Party No. 2, the report states: "This party, located at the fifty-first mile, was employed for purposes of comparison with the results in Parties No. 1 A and No. 1 B. Parboiled rice alone was consumed until October and no case of beri-beri appeared in any member of the party. In view of the results obtained it was decided to reverse the conditions and to place this party, hitherto on parboiled rice, on white rice, and to have Parties No. 1 A and No. 1 B henceforward on parboiled rice. This change was made in Party No. 2 on October 19, no other alteration, dietetic or otherwise, being made. . . . On April 25 a third case of beri-beri developed (in Party No. 2 now on white rice). On May 1 a fourth developed and three others on May 10 and 11. Amongst the parboiled rice party, no signs were noted. . . . On May 12 all the people remaining on white rice at the 61½ mile were changed to parboiled rice. After this date no case of beri-beri occurred."

As bearing upon the notion that the disease is infectious, the following from the report is interesting: "It resulted in consequence that cases of beri-beri in all stages of development were in contact with healthy people, yet at no time was there any evidence that the disease could be communicated to an individual on parboiled rice."

On February 12 of this year, I commenced the use of parboiled rice in the asylum for the insane—a hot-bed of beri-beri—and the results have been so remarkably successful that I determined to prepare this memorandum in order to lay the matter before the Government, with the hope that parboiled rice will be employed and beri-beri done away with in the services at least.

Before describing my own experiments, it might be well if something were said with regard to the history of beri-beri in Siam and to give such data as I can obtain in order to show the grave nature of the disease as a cause of invaliding and death.

Early records are impossible to obtain, but it is quite evident that the disease has been present in the country for many years.

Doctor Chr. Rasch, who was in Bangkok during 1891 and 1892, states in an article on "The Climate and the Diseases of Siam," published in *Virchow's Archives*, 1894, that: "As in the Malay Archipelago, so in Siam, beri-beri is fairly common especially in that class of the population living under bad hygienic conditions. In the new State jail, built on European lines and kept clean and decent, beri-beri is comparatively infrequent."

In 1892, however, Dr. T. Heyward Hays, who was then associated with the late Dr. Willis in the medical charge of the jail, had to do with rather a severe epidemic of beri-beri in this jail.

Dr. Scheube, who was in Siam about 1892, apparently made a careful study of the diseases prevalent in the country. In his book on "The Diseases of Warm Countries" he states that "the disease is frequent in Burma and Siam."

Colonial Medical Reports—No. 2.—Bangkok, Siam— *(continued).*

Subsequent to the date of these observations, the disease seems to have remained in abeyance for a number of years. When I arrived in Siam in April, 1897, I was struck with the absence of beri-beri from amongst the ordinary indigenous diseases. This was not only the experience of my predecessor, Dr. Nightingale, who had been in Siam since 1893, but also Dr. Deuntzer, who had been in private practice for many years in Bangkok, informed me that beri-beri was a rarity here.

Although both Dr. Nightingale and I had seen much of this disease in Johore and Singapore respectively before coming to Siam, and although we had ample opportunities of seeing all sorts of diseases amongst rich and poor, the first case of beri-beri noted by us was that of a Siamese police constable, who was admitted to the Police Hospital on August 29, 1900. Another case came into hospital a month later, and after that no further cases are noted in the hospital register until April, 1901, since when beri-beri has become one of the ordinary diseases seen in the hospital. During this year, 1901, a severe epidemic broke out amongst the soldiers in the central barracks, two cases were reported from the Navy, cases began to appear in the general hospitals other than the Police Hospital, where twenty-four cases were recorded during the year.

It should be noted that when we put a patient on a course of parboiled rice we find that recovery is rapid and is permanent provided he continues to eat only this form of rice. That people are beginning to understand this is shown by the passage in the Report on the Hospital for Infectious Diseases, where Dr. Carthew reports that sufferers from beri-beri are clamouring for admission to the hospital in order to obtain the benefits which their friends have derived.

A word in conclusion may be said with regard to the rice in question. It has a darker appearance than the white steam-milled rice, hence the name red rice applied to it. It has rather a mouldy flavour, and for the first few days it seems to be more difficult of digestion. This difficulty soon disappears, and most of its consumers say that it is an excellent laxative. The sense of stomach discomfort so generally felt by beri-beri patients is one of the first symptoms to disappear, and a general feeling of well-being early develops.

As the grains are rendered very hard owing to the method of preparation, care should be taken to cook the rice longer than ordinary white rice.

Conclusions.—It will be seen from the foregoing:—

(1) That the results of our experiments in Siam tally with those in the Straits Settlements and the Federated Malay States; and

(2) That until the real cause of beri-beri has been discovered, the disease can be prevented and actually cured in the majority of cases by the substitution of parboiled rice for white rice. It is, therefore, imperative upon all those who are responsible for the health of individuals in the services, or in such institutions as hospitals, asylums or schools, to note that they have at hand an easy method of preventing the disease, and that the responsibility for an outbreak should be laid upon them in a most emphatic manner.

I would like to draw special attention to the following points:—

(1) We have now records of practically 22,670 cases of the disease. With the exception of 2,099 cases seen in the hospitals, the cases reported are all young male adults. Beyond the hospital cases, I have no other records of beri-beri in the civilian population male and female.

(2) Beri-beri is usually rather a chronic disease extending over one, two, or more months, but if we, to be on the safe side, calculate that each of the above 22,670 cases was ill and off duty for one month only, we yet have an enormous loss of efficiency in the various services during these eight years.

(3) The financial loss to the Government, however, is even more striking. I calculate that on an average every case has cost the Government Ticals 20. This gives a total loss of Ticals 453,400, or an average of Ticals 56,676 per annum for eight years.

(4) The death-rate reported is no index of the total deaths from this disease, as, owing to the absence of registration of deaths in Siam, it is impossible to know the mortality from any disease. As I have stated, the death-rate from beri-beri may be anything from 2 to 50 per cent. Our figures give a rate of 4.6 per cent., but in my opinion this is far below the actual figures. The hospital returns give a general death-rate of 26 per cent. during these eight years. In the lunatic asylum during the year 125 the death-rate was 83.7 per cent.; during the year 126, 78 per cent.; and during 127, 88 per cent., where the conditions were remarkably unfavourable for recovery, however. But even to take the average death-rate at 10 per cent., we get a death-rate of 2,267 young male adults from this disease alone in eight years, an enormous economic loss to the country.

(5) As I have already demonstrated in practice in the asylum, police school, and reformatory at Koh Si Chang that the disease can be prevented by the use of parboiled rice, it is evident that by this simple means, which entails practically no more expense on the Government, a financial saving of Ticals 56,676 per annum is possible and a high death-rate can be avoided.

General Sanitation.

Removal of Refuse.—Within the city walls there are ninety-four fixed dust-bins for the collection of household refuse. These are emptied daily, and the contents removed in hand-carts to the refuse dumping-ground at Krok Ban Dinso. Outside the city walls the refuse is received into bullock carts, which pass down the main streets at regular hours.

This refuse is dumped on a piece of low-lying ground near to Samyek.

Conservancy and Public Latrines.—There are fifty-eight public latrines within the city walls and forty outside, containing a total of 439 separate rooms. The buckets in these are emptied daily by the Clean Work Company, which also deals with 1,630 private subscribers.

Drains.—These continue to give rise to much trouble and expense in attempting to keep them clean. In order to facilitate this work, a Lindsay Caverhill oil-motor pump has been ordered and is shortly expected. It will be mounted on a bullock trolley, and water from the klongs will be pumped up to flush the drains.

Mr. Ault's report upon a scheme for the sewerage of Bangkok has not yet come to hand. The matter has given him rather more thought than he anticipated, but he informs me that the report is now finished and ready for the printer. Judging from the results of Mr. Ault's labours in other countries, I have no doubt that the report will be a valued document in the hands of this department.

Water.—Although no actual commencement has yet been made in the work of providing the much-needed public water supply, I understand that much of the preliminary work has already been done, and continues to be done, and that an actual start may soon be confidently expected.

Deep Bores in Bangkok.—There are at present fourteen of these deep wells in use in Bangkok, and more are being sunk. It is difficult to estimate the amount of water which is daily pumped up from these wells, but its volume is so great that the supply of such a pure water has already had considerable influence on the number of cases of cholera in the city.

Last year I referred to the public spirit of His Royal Highness Prince Damrong and of the Bangkok Manufacturing Company in putting up public drinking fountains supplied from their deep wells. This year three more public fountains have been erected: one outside the house of Phya Sri Sahadheb, another fed from the same well at Mensri Bridge—a memorial erected by His Royal Highness Somdetch Krom Phra Bhanurangsi—and another at the premises of the Siam Electricity Company. In addition to these, during March and April, the department places outside the barracks large water-tanks which are filled by the kindness of the War Department from the deep well in the barracks. The water from these is drawn freely by the public in the neighbourhood. Finally, this department supplies water free from the deep well at Army and Navy Road.

The condition of the river water has this year been most satisfactory, the amount of chlorine never rising above 28.8 parts per 100,000, and that only upon one occasion, April 15, at high tide. The averages for each month at high and low tide, calculated from daily analysis, are given in Appendix XVI.

The Laboratory.—Here a daily analysis of the river water taken at high and low tide is made for the presence of salt. Many analyses of water samples taken from the various deep wells have also been undertaken during the year.

For the police, poisons, stomach contents in cases of death from suspected poisoning, and blood-stains upon weapons and on clothing are regularly examined.

Frequent examinations of blood, &c., for malaria, plague, typhoid fever, &c., of dejecta for cholera, and of sputum for tuberculosis, &c., are also made.

The erection of the new laboratory has already been referred to. It is highly suitable and convenient for the work required.

Meteorological Data.

The mean temperature for the year was 82.6, as compared with 82.8 for the previous year. The maximum temperature recorded in the shade was 102° F. on February 2, 3, and 4, as compared with 103° F. in April of the previous year. The lowest recorded was 60° F. on January 10, as compared with 52° F. in December of the previous year.

The rainfall this year amounted to 71.36 in., as compared with 49.37 in. for the previous twelve months.

For seven years from 1858 to 1865 (no records for 1862) Dr. Jas. Campbell's figures give a mean of 53.75 in. per annum.

For fifteen years from 1882-1906 (no records for 1901) the Borneo Company's average was 52.34 in.

For seven years from 1902 to 1908 the results obtained by this department give a mean of 55.33 in.

It will, therefore, be seen that this year's rainfall has been well above the average, and, in fact,

Meteorological Data in Fahrenheit Scale, for 1908.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Mean shade temperature	78.6	81.3	84.	87.8	85.3	84 4	84 3	83.4	83 28	82.6	78.	78.23
Mean of maxima in shade	93.6	91.2	95.8	96.	94.3	93 3	93 7	89.9	91.1	91.6	86.2	88.3
Mean of minima ,, ,,	65.7	71.	71.8	77.	76.19	75.3	75.	75.3	76.1	75.6	70.6	69.3
Highest temperature in shade	98.	102.	101.	101.	99.	98.	101.	97.	96.	96.	95.	93.
Lowest ,, ,, ,,	60.	61.	62.	74.	74.	72.	71.	74.	71.	74.	64.	61.
Greatest daily range in shade	34.	41.	37.	26.	23.	22.	25.	22.	24.	21.	22.	25.
Least ,, ,, ,, ,,	17.	11.	14.	10.	6.	14.	12.	6.	6.	10.	8.	11.
Mean ,, ,, ,, ,,	27.9	24.	19.7	87.7	18.5	18.3	18.3	16.1	16.	15.1	16.2	19.
Number of days on which rain fell	1.	3.	1.	9.	22.	20.	18.	22.	28.	23.	10.	4.
Rainfall in inches	.25	.90	.6	2.7	9.47	7.32	8.66	10.34	16.60	11.20	4.16	.33

Mean temperature for the year 82.6.
Total rainfall ,, ,, ,, 71.36.

has been a maximum year so far as the records in my hands go, with the exception of 1860, when the rainfall was 72.53 in. as measured by Dr. Campbell. The nearest to this was in 1889, when 70.07 in. were recorded at the Borneo Company's premises.

As the result of this heavy rainfall, Bangkok was generally under water for several months, except where the ground had been raised, and people had either to build temporary bridges from the roads to their doorsteps or had to enter or leave their houses in wheeled conveyances.

Prosecutions.—Prosecutions in the magistrate's courts were instituted in thirty-four cases for contravention of the sanitary decrees. Fines were inflicted in twenty-seven cases and seven cases were dismissed. As the fines in these twenty-seven cases amounted only to Ticals 65, it is feared that the deterrent effect of such prosecutions amounts to very little.

Colonial Medical Reports.—No. 3.—Nyasaland Protectorate.

MEDICAL REPORT FOR THE YEAR 1908-9.

By H. HEARSEY.

Principal Medical Officer.

Population.

The total European population numbered 595, as against 587 and 583 in the two preceding years.

The Asiatic population under registration numbered 457, showing a decrease of 58, as compared with last year's return:—

Europeans, Asiatics, and Natives within the Protectorate.

	Males	Females	Total
Europeans	436	159	595
Asiatics	449	8	457
Natives	433,700	562,466	996,166
Total ...	434,585	562,633	997,218

Comparative Table showing the Estimated Population in the Protectorate during the Previous Three Years.

	Males	Females	Total
1905-6			
Europeans	460	148	608
Asiatics	547	4	551
Natives	441,113	535,528	976,641
1906-7			
Europeans	452	131	583
Asiatics	509	9	518
Natives	418,338	509,017	927,355
1907-8			
Europeans	449	138	587
Asiatics	507	8	515
Natives	423,150	524,018	947,168

Births.

Among the European population there were fourteen births registered during the year, giving a birth-rate of 23.52 per mille. The rates for the last three preceding years were as follows:—

Rate per 1,000: 1905-6, 29·60; 1906-7, 32·59; 1907-8, 25·7.

Return of Births Registered by Districts, 1908-9.

District	Males	Females	Total	Rate per 1,000
Blantyre	4	4	8	—
Zomba	2	1	3	—
West Nyasa ...	1	—	1	—
Marimba	1	—	1	—
Central Angoniland	—	1	1	—
Total	8	6	14	23·52

Deaths.

The deaths registered during the year totalled 27, giving a death-rate of 25.66 per 1,000. These deaths were made up as follows:—

European males	15
,, females	nil
,, infants	2
Asiatics	10
Total	27

The European death-rate was 28.57 per 1,000. The Asiatic death-rate was returned at 21.88 per 1,000.

The following was the European death-rate per mille for the three preceding years:—

Rate per 1,000: 1905-6, 34.54; 1906-7, 48.03; 1907-8, 22.29.

It will be observed that while the European population in the Protectorate has increased from 583 to 595 the death-rate per 1,000 has advanced from 22.29 to 28.57.

Principal Causes of Deaths.

There were seven deaths from malarial fever and its sequelæ, five from blackwater fever, and three from dysentery; these three diseases accounting for more than one-half of the total mortality for the year.

Port Herald and Chiromo still maintain their evil reputation for showing the highest death-rate in the country, notwithstanding that all work connected with railway construction has ceased. Thus, of the twenty-seven deaths registered during the past year, as many as thirteen were recorded at these two stations.

Although the returns show but two deaths in the Lower Shire (Port Herald) district, as compared with eleven in the Ruo (Chiromo) district, it is to be remembered that a large proportion of the serious cases from Port Herald, where there is no doctor, are brought to Chiromo for treatment,

and that the mortality among these is accordingly credited to the latter station.

A hospital for Europeans, situated on the Port Herald hills, would no doubt greatly assist in diminishing this abnormally heavy death-rate, for with the uniformly high temperature obtaining at these settlements cases of malarial fever do not do well and are frequently of the hyperpyrexial type, with a fatal termination as the inevitable result.

DEATHS REGISTERED BY DISTRICTS.

	Males	Females	Total	Rate per 1,000
Lower Shire ...	2	—	2	—
Ruo	11	—	11	—
Blantyre	7	—	7	—
West Shire ...	1	—	1	—
Zomba	2	2	4	—
Upper Shire ...	1	—	1	—
Likoma Island ...	1	—	1	—
TOTAL	25	2	27	25·66

DEATHS REGISTERED (EUROPEAN AND ASIATIC) AND RATE PER 1,000.

	Adults		Infants		Total
	Males	Females	Males	Females	
Europeans ...	15	—	1	1	17
Asiatics ...	9	1	—	—	10
TOTAL ...	24	1	1	1	27

Rate per 1,000: Europeans, 28·57; Asiatics, 21·88; total, 25·66.

CAUSES OF DEATHS REGISTERED DURING 1908-9.

	Males	Females	Total
Blackwater fever	5	—	5
Chronic alcoholism	1	—	1
Dysentery	3	—	3
Embolism of Lung	1	—	1
Hæmorrhage from lion bite ...	1	—	1
Liver abscess	1	—	1
Malarial fever and its sequelæ	7	—	7
Mitral disease	1	—	1
Pleurisy with Pneumonia ...	1	—	1
Pneumonia	1	—	1
Premature birth	—	1	1
Suicide	—	1	1
Tubercular laryngitis	1	—	1
Typhoid fever	1	—	1
Cause unknown	1	—	1
TOTAL	25	2	27

Vital statistics of the native population are not available.

PREVALENCE OF SICKNESS IN DIFFERENT SEASONS OF THE YEAR AND NOTES AS TO THE GENERAL CHARACTER, &c., OF THE DISEASES PREVAILING.

SMALL-POX.

During the past year an outbreak of small-pox of unusual severity has occurred in the Protectorate. It was, however, confined more or less to its southern half, where alone it can be said to have prevailed with epidemic intensity. An abnormal feature of this outbreak has been that instead of disappearing during the wet season, as is usually the case, it has persisted throughout the year, and at the time of writing fresh cases are being reported from different parts of the Protectorate. The epidemic attained its height during the dry months, and only gradually abated with the setting in of the rains.

The following is a brief summary of events connected with the outbreak, and the measures necessitated for coping with it. In the latter part of 1907, cases of small-pox were reported from the Ruo and Mlanje districts and from the Lilongwe and Dowa sub-districts of Central Angoniland. These outbreaks were limited in extent, and with the advent of the rains in the early part of 1908, appeared entirely to have died out. In April of the same year, however, cases were reported on the borders of the Zomba district contiguous with Mlanje, and within a short period it was found that several districts had become involved, and that the diseases had assumed a somewhat alarming and widespread character.

Outbreaks of small-pox in Central Angoniland, the largest and most populous district in the Protectorate, are of annual occurrence. The outbreak in the Mlanje district, however, was attributed by the Resident to an influx of unprotected natives from the adjacent Portuguese territory, amongst whom cases were first observed, and who were, therefore, believed to have brought the disease with them. These aliens belong to the Anguru tribe, and annually migrate into the Protectorate either in search of work or for the purpose of permanently settling down. In common with the Yaos the custom prevails amongst them of resorting to inoculation as a protective measure on the first appearance of small-pox in their midst. This practice, which is useful in its way in that it affords the protection desired, without much risk to life, is also one of the most important factors in the dissemination of the disease, as inquiry into the mode of spread of the present epidemic in certain localities has clearly established.

The practice of inoculation and the gradual growth of the non-immune population having increased facilities and inducements for travelling from one part of the country to another accounted in a large measure for the widespread character which the epidemic assumed.

The parts of the Protectorate which suffered most severely were the South Nyasa, Blantyre and Central Angoniland districts; those which suffered least were the West Nyasa, Mlanje, Ruo and Lower Shire; while the Marimba, Mombera and North Nyasa districts remained almost entirely free from infection.

As many cases occurred in outlying parts of the various districts involved and thereby escaped notice, the returns furnish only an approximate estimate of the actual sickness and mortality. The total number of cases treated in segregation camps was 5,982, amongst whom there were 487 deaths, which represents a case-mortality of 8.14 per cent. The heaviest mortality was recorded in the Central Angoniland district, but the West Shire, Blantyre and South Nyasa districts also had a large percentage of fatal cases. There was one non-fatal case in a European in the Blantyre district.

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In order to deal effectually with an epidemic of so widespread a character and to limit its further spread, it was clearly necessary to supplement the usual preventive measures with the vaccination of unprotected natives on a somewhat extended scale. To carry this measure into effect two requirements were essential, namely: (1) The employment of an adequate number of vaccinators, and (2) a sufficient vaccine lymph supply. The first of these requirements was met by raising the grant of wages of vaccinators from £18 to £240 per annum. This enabled twenty-four native vaccinators to be employed in place of the two or three who in previous years comprised the entire vaccination staff. The second requirement was met by increasing the grant for the purchase of lymph from £8 to £100 per annum. This increased supply enabled each of the twenty-four vaccinators to be furnished with a fresh tube of lymph every three weeks. Vaccination can thus be now carried on with a new strain of lymph at short intervals of time, counteracting in a large measure the negative results which otherwise follow an arm-to-arm vaccination continuously employed. The means for carrying out vaccination work on a more or less extended scale having thus been secured, the aid of police was requisitioned in most of the districts for the purpose of bringing compulsion to bear on any natives who proved recalcitrant, and the wages of these men was met by supplementary grants.

Among the measures adopted for the prevention of spread of the disease, the following were the most important: Chiefs and head-men were given to understand that the practice of inoculation with variolous matter was a punishable offence. Natives found to be suffering from small-pox were immediately isolated, and treated in segregation camps guarded by police. All contacts were isolated and vaccinated. Infected clothing was burnt, to replace which calico was supplied free of cost. Further, compensation has been paid to natives in some instances when it has been found necessary to destroy their huts.

Pneumonia.

As pointed out in previous reports, pneumonia is one of the most fatal diseases to which natives are subject, the mortality among them in their own villages during the cold months of the year, namely, May, June and July, being largely due to this cause. The disease sometimes runs so rapid a course to a fatal termination that friends and relatives have frequently been known to suspect foul play. There were sixty cases of pneumonia treated during the past year, with five deaths.

Tick Fever.

This disease seems unquestionably to be on the increase, and the vector of the spirochætes, *O. moubata*, likewise appears to be establishing for itself a much wider range of distribution. At first confined mainly to the lake districts, more particularly those to the north and south-west, the tick is now to be met with as far south as Blantyre. It swarms in native huts in such localities as Central Angoniland, and it is also met with in large numbers even in brick buildings, especially those which have a grass roof. The Medical Officer at Dowa found the brick-built native prison at this station teeming with ticks, which were distributed all over the building —floor, walls and roof. Natives in *O. moubata* infested localities must have a partial or complete immunity from spirillum fever, for newcomers from tick-free areas, such as personal servants, frequently get infected when one is travelling through country infested with this pest. Seventeen cases of spirochætosis have been recorded this year. There would appear to be no means of getting rid of this pest except by burning the huts, and in the case of brick buildings substituting iron for the grass roofing.

Dysentery.

There were 296 cases of dysentery with six deaths, as compared with 346 cases and four deaths last year. The disease is most prevalent during the early part of the wet season, that is to say, in the months of November, December and January. The type of dysentery usually met with is the bacillary; amœbic dysentery occurs, but is not so prevalent as the former. This no doubt explains the comparative rarity of abscess of the liver in natives, amongst whom dysentery is one of the commonest ailments, frequently assuming an epidemic character.

Malarial Fever.

There was a very considerable decrease in the number of cases which came under treatment this year as compared with last year, the figures for the two years being 823 and 1,256 respectively. The total number of deaths registered from this cause was seven, the mortality being entirely referable to the European and Asiatic communities. While malaria cannot be said to be an ailment to which the adult native is commonly subject, there is no doubt but that the disease is extremely prevalent among children and that it is the cause of a large infant mortality. Thus one of our medical officers, engaged on sleeping sickness investigations, recently reported that finding anophelines unusually numerous at one of his camping grounds he next morning examined the blood of all the children in a village near by, and found a malignant tertian infection in each one, the number of children thus examined being fourteen. Enlargement of the spleen is so invariable an accompaniment of infection in children that the malariousness or otherwise of a given locality may at once be gauged by directing attention to this point alone.

Leprosy.

Seven cases of this disease have applied for treat-

ment during the year. The question of leprosy in Nyasaland will be dealt with in a separate report.

YAWS.

This disease is endemic on the south-western shore of the Lake, but cases are often met with in other parts of the Protectorate. Last year some fifty natives suffering from yaws were segregated and treated by the Medical Officer of the South Nyasa district. The number of cases returned this year was thirty-three.

BERI-BERI.

There were twenty-three cases with one death, as compared with thirty-five cases and six deaths last year. All these men had contracted the disease outside the limits of the Protectorate, either in South Africa or on the East Coast. Two native soldiers have just returned from Zanzibar suffering from beri-beri in an advanced stage.

PATIENTS TREATED IN THE FOLLOWING EUROPEAN HOSPITALS:—

BLANTYRE HOSPITAL

	Cases	Deaths
Abscess	2	—
Accouchement	9	—
Alcoholism	1	—
Blackwater fever	6	1
Cystitis	1	—
Dysentery	7	—
Gastritis	3	—
Malarial fever	17	—
Neurasthenia	3	—
Pneumonia	1	1
Ptomaine poisoning	1	—
Rodent ulcer	1	—
Synovitis	1	—
TOTAL	53	2

ZOMBA HOSPITAL

	Cases	Deaths
Accouchement	3	—
Carbuncle	1	—
Dysentery	1	1
Malarial fever	8	—
Phagedæna	1	—
Typhoid fever	1	—
TOTAL	15	1

FORT JOHNSTON HOSPITAL

	Cases	Deaths
Malarial fever	2	—

INSANITY.

Six lunatics have been under treatment at Zomba during the year, and there has been one death. The Lunatic Asylum is not yet ready to receive cases, but the work that remains to be done will probably be finished within the next few months.

GENERAL SANITARY CONDITION OF THE PROTECTORATE.

Speaking of the Protectorate generally, it may fairly be said that sanitary matters as a rule continue to receive a large measure of attention, a statement the correctness of which is at once justified by the clean and tidy appearance presented by the various settlements.

All questions affecting the sanitation of townships are dealt with by Town Councils, the Government Medical Officer being ex-officio the Medical Officer of Health. A separate quarter is provided for Asiatics, and there is the usual native location, the sanitation of both which is kept under careful supervision.

An Ordinance for the Notification of Infectious Diseases has been in force during the past year, and with satisfactory results.

The sources of water-supply are variable, drinking water being obtained from streams and rivers, springs or wells. Owing to the danger of contamination it is always advisable to boil water intended for consumption.

The Conservancy arrangements are similar throughout the country, either the pail or dry earth system being in use. Privies have gradually been abolished. Shallow trench latrines are provided for the use of natives.

The subjoined table shows the average number of European and Indian residents in each of the townships, together with the deaths which have occurred during the year.

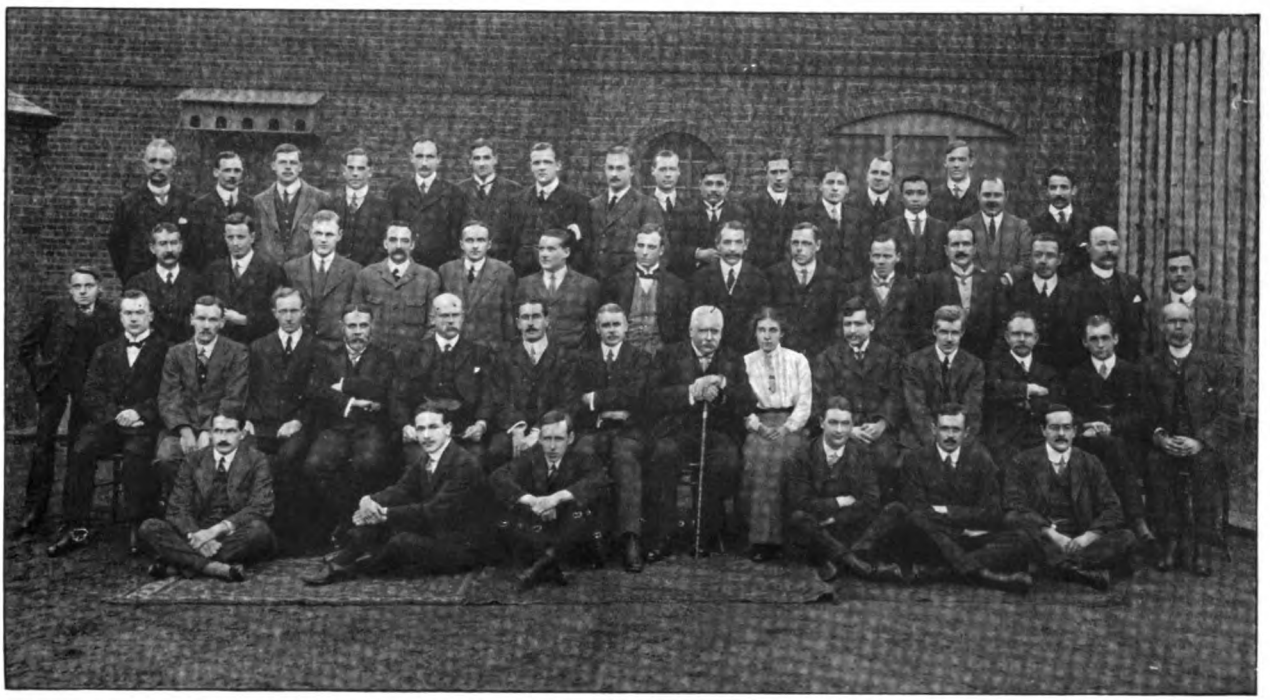
Township	Average European Population	Average Indian Population	Deaths during the Year	Rate per 1,000
Port Herald	22	43	2	30·7
Chiromo	20	45	11	169·2
Blantyre	253	113	7	19·12
Limbe	33	67	1	10·0
Zomba	65	125	4	21·05
Fort Johnston	17	15	—	—

METEOROLOGICAL RETURN FOR THE YEAR ENDED MARCH 31, 1909.

Month	Temperature						Rainfall		Wind		Remarks
	Solar maximum	Minimum on grass	Mean shade daily maximum	Mean shade daily minimum	Range	Mean	Amount in inches	Degree of Humidity. Saturation = 100 per cent.	General direction	Average force	
April	—	60·9	77·7	62·6	15·1	70·2	7·64	84	E.	·9	Solar maximum readings from April to December unreliable, as instrument was proved to be defective. New instrument placed in position in December.
May	—	56·7	73·3	57·0	17·3	60·2	·44	80	S.	·7	
June	—	53·3	73·9	56·3	17·6	65·1	·02	75	E.	·9	
July	—	49·9	72·5	57·4	15·1	64·9	·43	77	E.	1·1	
August	—	52·7	77·3	55·6	21·9	66·4	nil	69	N.	1·8	
September	—	56·3	82·7	58·9	23·9	70·8	·60	58	N.	2·1	
October	—	61·2	86·3	64·5	21·8	75·4	1·88	56	N.	1·7	
November	—	64·7	86·9	66·8	20·1	76·8	3·16	58	N.	1·4	
December	—	62·9	78·9	64·8	14·1	71·8	13·51	83	E.	·8	
January	157	61·4	80·0	63·7	16·3	71·8	14·81	83	E.	·6	
February	157	62·5	80·8	64·5	15·8	72·4	10·48	83	E.	·7	
March	156	62·9	81·4	65·0	16·4	73·2	7·68	86	E.	·7	

LONDON SCHOOL OF TROPICAL MEDICINE.

38th Session. January-April, 1912.



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On the Ground—L. Doudney, V. G. L. van Someren, R. T. Leiper (Helminthologist), P. W. Black, P. M. Rennie (Capt. I.M.S.), E. F. Lawson.

Absent—Col. A. Alcock (Entomologist), C. M. Wenyon (Protozoologist), Miss Summers (Asst. Entomologist), A. T. Kember, M. Mackenzie, W. McClure, T. Legge, A. Fahmy, A. Baldie, J. Sandilands, A. Connal, H. Morphew, L. E. Knollys, A. W. H. Grant, H. P. Lobb, J. E. S. Old, J. T. Tillotson, B. T. Milthorp, W. D. Inness, J. Pearson, T. R. Beale-Brown, F. C. Farquhar, J. H. Writer, Miss D. R. C. Patell, G. Girgis Eldaba, A. K. Contractor, E. L. Mansel.

LONDON SCHOOL OF TROPICAL MEDICINE

(UNIVERSITY OF LONDON),

Under the Auspices of His Majesty's Government,

CONNAUGHT ROAD, ALBERT DOCKS, E.

In connection with the Albert Dock Hospital of the SEAMEN'S HOSPITAL SOCIETY.

THE SEAMEN'S HOSPITAL SOCIETY was established in the year 1821 and incorporated in 1833, and from time to time has been enlarged and extended. It now consists of the Dreadnought Hospital, Greenwich, to which is attached the London School of Clinical Medicine; the Royal Victoria and Albert Docks Hospital; the East and West India Docks Dispensary; and the Gravesend Dispensary.

Over 30,000 Patients treated annually. Of this number many are Cases of Tropical Disease.

The School buildings are situated within the grounds of the Royal Victoria and Albert Docks Hospital.

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LECTURES AND DEMONSTRATIONS DAILY BY MEMBERS OF THE STAFF.

There are three Sessions yearly of three months each, viz., from October 1st to December 31st, from January 15th to April 14th, and from May 1st to July 31st inclusive. Women Graduates are received as Students.

Certificates are granted after Examination at the end of each Session, and the course is accepted by Cambridge University as Qualifying for Admission to their Examination for the Diploma in Tropical Medicine and Hygiene, and by London University as Study for the M.D. in Branch VI. (Tropical Medicine).

Fee for course £16 16s.; shorter periods by arrangement.

Students can be provided with Board and Residence, or partial Board, at the School.

Medical men requiring posts in the Tropics may apply to the Secretary at the School, where a Register is kept.

A syllabus, with the general course of study, can be had on application to the undersigned, from whom further information may be obtained.

Students of the London School of Tropical Medicine, who join the London School of Clinical Medicine, will be allowed an abatement on their fees and *vice versâ*.

Chief Office—SEAMEN'S HOSPITAL, GREENWICH, S.E.

Return of Diseases and Deaths in 1909 amongst Europeans and Natives in the Nyasaland Protectorate.

GENERAL DISEASES.

	Deaths	Total Cases Treated
Alcoholism	—	1
Anæmia	—	—
Anthrax	—	—
Beri-beri	—	23
Bilharziosis	—	—
Blackwater Fever	3	14
Chicken-pox	—	5
Cholera	—	—
Choleraic Diarrhœa	—	—
Congenital Malformation	—	—
Debility	2	41
Delirium Tremens	—	—
Dengue	—	—
Diabetes Mellitus	—	—
Diabetes Insipidus	—	1
Diphtheria	—	—
Dysentery	6	296
Enteric Fever	—	1
Erysipelas	—	3
Febricula	—	—
Filariasis	—	—
Gonorrhœa	—	37
Gout	—	—
Hydrophobia	—	—
Influenza	—	—
Kala-Azar	—	—
Leprosy	—	7
(*a*) Nodular	—	—
(*b*) Anæsthetic	—	—
(*c*) Mixed	—	—
Malarial Fever—	—	—
(*a*) Intermittent	—	—
Quotidian	—	—
Tertian	—	13
Quartan	2	—
Irregular	—	17
Type undiagnosed	1	700
(*b*) Remittent	1	110
(*c*) Pernicious	—	—
(*d*) Malarial Cachexia	—	—
Malta Fever	—	—
Measles	—	12
Mumps	—	24
New Growths—	—	—
Non-malignant	—	8
Malignant	1	6
Old Age	—	—
Other Diseases	11	83
Pellagra	—	—
Plague	—	—
Pyæmia	—	—
Rachitis	—	—
Rheumatic Fever	—	2
Rheumatism	—	186
Rheumatoid Arthritis	—	—
Scarlet Fever	—	—
Scurvy	—	4
Septicæmia	—	1
Sleeping Sickness	—	—
Sloughing Phagedæna	—	—
Small-pox	487	5982
Syphilis	—	—
(*a*) Primary	—	72
(*b*) Secondary	—	45
(*c*) Tertiary	—	7
(*d*) Congenital	—	3
Tetanus	—	—
Trypanosoma Fever	—	2
Tubercle—	—	2
(*a*) Phthisis Pulmonalis	—	5
(*b*) Tuberculosis of Glands	—	—
(*c*) Lupus	—	—
(*d*) Tabes Mesenterica	—	—
General Diseases—*continued.*		
(*e*) Tuberculous Disease of Bones	—	—
Other Tubercular Diseases	—	—
Varicella	—	—
Whooping Cough	—	28
Yaws	—	33
Yellow Fever	—	—

LOCAL DISEASES.

	Deaths	Total Cases Treated
Diseases of the—		
Cellular Tissue	1	292
Circulatory System—	—	—
(*a*) Valvular Disease of Heart	—	5
(*b*) Other Diseases	1	11
Digestive System—	1	1239
(*a*) Diarrhœa	4	967
(*b*) Hill Diarrhœa	—	—
(*c*) Hepatitis	—	3
Congestion of Liver	—	2
(*d*) Abscess of Liver	—	—
(*e*) Tropical Liver	—	—
(*f*) Jaundice, Catarrhal	—	—
(*g*) Cirrhosis of Liver	—	—
(*h*) Acute Yellow Atrophy	—	—
(*i*) Sprue	—	—
(*j*) Other Diseases	—	—
Ear	—	177
Eye	—	284
Generative System—	—	—
Male Organs	—	22
Female Organs	2	24
Lymphatic System	—	83
Mental Diseases	1	363
Nervous System	—	—
Nose	—	13
Organs of Locomotion	—	201
Respiratory System	—	1066
Skin—	—	—
(*a*) Scabies	—	997
(*b*) Ringworm	—	—
(*c*) Tinea Imbricata	—	—
(*d*) Favus	—	—
(*e*) Eczema	—	192
(*f*) Other Diseases	—	2366
Urinary System	—	9
Injuries, General, Local—	2	4042
(*a*) Siriasis (Heatstroke)	—	—
(*b*) Sunstroke (Heat Prostration)	—	—
(*c*) Other Injuries	—	—
Parasites—	—	37
Ascaris lumbricoides	—	5
Oxyuris vermicularis	—	2
Dochmius duodenalis, or Ankylostoma duodenale	—	1
Filaria medinensis (Guinea-worm)	—	—
Tapeworm	—	—
Poisons—	—	—
Snake-bites	—	8
Corrosive Acids	—	—
Metallic Poisons	—	—
Vegetable Alkaloids	—	2
Nature Unknown	—	—
Other Poisons	—	3
Surgical Operations—	—	—
Amputations, Major	2	10
,, Minor	—	358
Other Operations	—	—
Eye	—	—
(*a*) Cataract	—	—
(*b*) Iridectomy	—	—
(*c*) Other Eye Operations	—	—

VACCINATION.

The aggregate number of vaccinations performed during the year was 75,259, made up as follows:—

Ruo	11,363
West Shire	534
Blantyre	9,288
Mlanje	130
Zomba	23,953
Upper Shire	6,342
Central Angoniland	20,897
South Nyasa	352
Mombera	2,400
TOTAL	75,259

The lymph employed in these operations has been obtained from the Lister Institute of Preventive Medicine, and has given entire satisfaction. Over 90 per cent. of these vaccinations, however, were performed with humanized lymph, and it is mainly in order to do away with the dangers attendant on arm-to-arm vaccination, more especially during the progress of an epidemic, that a Vaccine Lymph Installation for Nyasaland has been recommended.

At the last November Session of the Legislative Council "The Vaccination Ordinance, 1908," was passed. This Ordinance is based on the "Vaccination Act, 1867," and will largely strengthen the hands of the medical department when dealing with future epidemics. But many of the provisions of the Ordinance can only gradually be made operative as various initial difficulties will have to be overcome, and some time must elapse before the requisite number of natives fitted to hold the post of Public Vaccinators can be appointed.

RETURN OF THE STATISTICS OF POPULATION FOR THE YEAR 1908-9.

	Europeans	Asiatics	Natives
Number of inhabitants in 1908-9	595	457	996,166
,, ,, births during the year	14	—	—
,, ,, deaths ,, ,,	18	10	—
,, ,, immigrants during the year	—	—	—
,, ,, emigrants ,, ,,	—	—	—
,, ,, inhabitants in 1907-8	587	515	947,168
Increase	8	—	48,998
Decrease	—	58	—

MEDICAL REPORT FOR THE YEAR ENDING DECEMBER 31, 1909.

Colonial Medical Reports.—No. 4.—Basutoland.

By EDWARD C. LONG.

Principal Medical Officer.

POPULATION.

NO statistics concerning the birth and death-rate are available. A census of the Maseru Reserve was taken in November, 1909, and an effort is being made to obtain information of births and deaths occurring in the Reserve. It is too early yet to attempt to draw any conclusions from the returns to hand.

POPULATION.

	Europeans and Whites	Africans	Mixed and Coloured
Number of inhabitants in 1904	895	347	731	222
Number of inhabitants in 1891	578	218	324	180
Increase	317	129	407	42

INCIDENCE OF SICKNESS.

There is nothing of unusual interest in the information supplied by this year's nosological return. Epidemic diseases have been, if anything, even less prevalent than usual. One mild case of smallpox occurred amongst a gang of workmen employed by the Public Works Department. The patient and all contacts were promptly isolated and re-vaccinated, and no further cases occurred. Enteric fever was rather more prevalent, but most of the cases occurred in labourers returning from labour areas.

The large number of cases of dysentery was doubtless attributable to the unusually wet season experienced in 1909. The type of disease was, however mild, and only one death occurred among the in-patients.

The cases of malarial fever recorded were all imported cases from Bechuanaland and Rhodesia.

Erysipelas has been noted twice in hospital, but no spread of the disease has occurred. Owing to the difficulty of diagnosing cutaneous diseases in natives, I am inclined to the opinion that erysipelas is more frequent than the returns would indicate.

Tuberculosis appears to be still on the increase.

The large number of cases of malignant disease recorded during the year is of interest. I do not think that it means there are more cases than formerly, but indicates that with the increased hospital accommodation more come under observation. It was formerly supposed by some South African authorities that carcinoma of the uterus did not occur among the coloured races. Three cases are recorded last year, all advanced and inoperable. Doubtless many early cases escape recognition. Gynæcological diagnosis as regards natives is beset with difficulties. Parents seldom notice, or at any rate inform one of, symptoms which would lead to the necessary examinations being made. It is only when gross lesions occur that attention is directed to the genito-urinary system.

Colonial Medical Reports—No. 4.—Basutoland—(*continued*).

RETURN OF DISEASES AND DEATHS IN 1909 AT THE

Basutoland Hospitals.

GENERAL DISEASES.

	Natives		
	Admissions	Deaths	Total Cases Treated
Alcoholism	—	—	10
Anæmia	5	—	617
Anthrax	—	—	—
Beri-beri	—	—	—
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	—	—	—
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	8	1	425
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	1	—	5
Diabetes Insipidus	—	—	—
Diphtheria	3	—	20
Dysentery	14	1	101
Enteric Fever	26	3	52
Erysipelas	2	—	12
Febricula	23	—	314
Filariasis	—	—	—
Gonorrhœa	11	—	866
Gout	—	—	17
Hydrophobia	—	—	—
Influenza	1	—	47
Kala-Azar	—	—	—
Leprosy	—	—	—
(*a*) Nodular	—	—	5
(*b*) Anæsthetic	—	—	9
(*c*) Mixed	—	2	36
Malarial Fever—	5	—	13
(*a*) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	—	—	—
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	—	—	—
(*c*) Pernicious	—	—	—
(*d*) Malarial Cachexia	—	—	—
Malta Fever	—	—	—
Measles	—	—	2
Mumps	—	—	53
New Growths—	—	—	—
Non-malignant	41	—	128
Malignant	26	1	36
Old Age	—	—	—
Other Diseases	—	—	337
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	1	1	2
Rachitis	—	—	3
Rheumatic Fever	—	—	—
Rheumatism	29	—	1107
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	6
Scurvy	2	—	22
Septicæmia	—	—	—
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	—	—	1
Syphilis	—	—	—
(*a*) Primary	—	—	17
(*b*) Secondary	6	2	875
(*c*) Tertiary	25	—	973
(*d*) Congenital	2	1	671
Tetanus	1	1	1
Trypanosoma Fever	—	—	—
Tubercle—	—	—	—
(*a*) Phthisis Pulmonalis	16	4	117
(*b*) Tuberculosis of Glands	31	—	109
(*c*) Lupus	14	1	43
GENERAL DISEASES—*continued.*			
(*d*) Tabes Mesenterica	1	1	7
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	24
Whooping Cough	—	—	—
Yaws	—	—	—
Yellow Fever	—	—	—

LOCAL DISEASES.

	Natives		
	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	121	1	579
Circulatory System—	—	—	—
(*a*) Valvular Disease of Heart	15	8	112
(*b*) Other Diseases	6	1	52
Digestive System—	77	2	7,415
(*a*) Diarrhœa	—	—	—
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	—	—	—
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	—	—	—
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	—	—	—
(*g*) Cirrhosis of Liver	—	—	—
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	—	—	—
Ear	9	—	364
Eye	76	—	603
Generative System—	—	—	—
Male Organs	57	—	171
Female Organs	117	2	1,224
Lymphatic System	8	—	119
Mental Diseases	—	—	—
Nervous System	39	3	445
Nose	2	—	543
Organs of Locomotion	85	—	298
Respiratory System	73	9	2,855
Skin—	—	—	—
(*a*) Scabies	2	—	506
(*b*) Ringworm	—	—	46
(*c*) Tinea imbricata	—	—	—
(*d*) Favus	—	—	4
(*e*) Eczema	—	—	307
(*f*) Other Diseases	14	—	1,166
Urinary System	10	1	53
Injuries, General, Local—	130	10	636
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	—	—	—
Parasites—	1	—	105
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	—	—	—
Filaria medinensis (Guinea-worm)	—	—	—
Tape-worm	—	—	—
Poisons—	—	—	—
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	1	—	2
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	—	5	1,466
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

Diseases of Respiratory System.—There were a good many cases of pneumonia, which appears to be becoming more prevalent.

General.—There was a considerable increase in the total number of cases treated during the year, but the general incidence of disease was the same as in previous years.

Sanitary Affairs.—The sanitary condition of the territory remains unaltered.

Vaccination.—This is still steadily enforced as far as possible in the absence of any legislation dealing with the subject: no difficulty is, however, experienced in inducing people to be vaccinated.

I would call attention to the large increase in the number of in-patients. 1,136 cases were admitted, of whom 55 died. There were 1,466 operations performed. Of the tumours removed, 20 were either uterine or ovarian, and 14 lipomata.

METEOROLOGICAL RETURN FOR THE YEAR.

	Temperature						Rainfall	
	Solar maximum	Minimum on grass	Shade maximum	Shade minimum	Range	Mean	Amount in inches	Degree of humidity
Jan.	93.6	50.7	78.9	53.4	25.5	66.2	85.4	79
Feb.	96.1	52.6	76.8	52.3	24.8	64.4	9.74	82
Mar.	96.7	46.1	73.8	50.2	23.5	62.0	5.07	79
April	90.0	36.0	70.4	43.2	27.8	56.5	3.37	80
May	82.3	32.4	63.4	38.3	25.1	50.9	3.22	79
June	80.7	26.9	62.6	286.	34.0	45.6	—	74
July	81.4	22.7	61.6	29.5	32.0	45.5	0.02	54
Aug.	86.8	29.6	67.4	33.7	33.6	50.4	0.20	50
Sept.	96.0	37.0	71.4	40.3	31.0	55.9	3.08	64
Oct.	101.0	35.0	73.9	41.3	32.3	56.2	1.39	67
Nov.	105.0	40.0	80.3	45.9	34.4	63.1	2.86	50
Dec.	105.0	43.0	78.7	50.3	28.4	64.3	6.58	64
Totals	1114.6	5452.0	859.2	507.0	352.4	681.0	44.07	822
Mean	92.8	37.6	71.6	42.2	29.3	57.7	—	68.5

Colonial Medical Reports.—No. 5.—Colony of the Gambia.

MEDICAL REPORT FOR THE YEAR 1909.

By T. HOOD.

Senior Medical Officer.

VITAL STATISTICS.

The number of deaths registered during the year is the lowest since 1900, and for the first time on record the number of births registered in the colony is slightly in excess of the number of deaths.

COMPARATIVE STATEMENT OF BIRTHS AND DEATHS FOR THE PAST NINE YEARS.

Years	Births	Deaths	Births in excess	Deaths in excess
1901	348	380	—	32
1902	403	410	—	7
1903	408	495	—	87
1904	371	408	—	37
1905	331	376	—	45
1906	338	359	—	21
1907	326	386	—	60
1908	351	387	—	36
1909	339	330	9	—

and of the 330 deaths registered, 101 were of children under five years of age.

The death-rate of the colony is based on the census of 1901, and very probably does not represent any great degree of accuracy.

The following table gives some indication of the healthy and unhealthy periods of the year in the Gambia. The register affords no reliable information as to the cause of the majority of deaths recorded, but I have little doubt that many are preventible, and that the unhealthy months will gradually show improvement as the knowledge of tropical sanitation and hygiene spreads and is acted upon by the younger generation.

MONTHLY DEATH RATE FOR THE PAST SIX YEARS.

Years	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1904	33	36	33	42	20	25	22	39	38	33	44	43
1905	30	45	28	23	30	20	31	32	39	38	31	29
1906	20	24	27	30	23	39	25	23	42	32	34	40
1907	22	46	43	15	20	28	32	30	45	48	38	19
1908	32	22	33	25	24	33	30	39	35	34	48	32
1909	31	20	24	22	21	30	36	34	28	29	28	27
Total	168	193	188	157	138	175	176	197	227	214	223	190
Average	28	32	31	26	23	29	29	33	38	36	37	32

The death-rate of babies still remains high. Midwifery is a branch of medical work that is neglected in the Gambia, and so far it has not been possible to train midwives; the lives of many babies and not a few mothers are undoubtedly lost on this account.

INFANTILE MORTALITY FOR THE PAST EIGHT YEARS.

Years	Total Births	Infantile Mortality under 5 years	Deaths under one year	Deaths under one week	Deaths under 24 hours	Still births
1902	403	139	59	24	23	36
1903	408	158	73	20	7	45
1904	371	146	74	21	19	39
1905	331	132	61	20	10	24
1906	338	102	43	12	14	31
1907	326	126	56	22	11	13
1908	351	155	77	23	—	32
1909	339	101	50	11	17	24

The health of European residents in the colony was fairly good this year, although four died as the result of malarial infection; one case was that of an infant of two months, and another was a lady taken from a passing ship and who only survived a few hours.

The three patients that were invalided have all survived very severe attacks of malaria, and are now in good health.

SICKNESS OF EUROPEAN RESIDENTS.

	1905	1906	1907	1908	1909
Number of European Residents ...	114	132	128	107	151
Number of Europeans Treated ..	43	49	42	27	53
Number of Europeans Died ...	5	3	2	4	4
Malarial Fever Cases...	22	21	28	30	38
Number of Europeans Invalided ...	1	1	2	3	3

The number of Europeans who have died in the colony each year for the last five years, from climatic causes or otherwise, is given in the following table :—

Years	Landed from a ship	Climatic	Otherwise	Total	Remarks
1905 ...	— ...	2 ...	3 ...	5 ...	—
1906 ...	— ...	1 ...	2 ...	3 ...	1 drowned
1907 ...	— ...	1 ...	1 ...	2 ...	—
1908 ...	1 ...	2 ...	1 ...	4 ...	—
1909 ...	1 ...	3 ...	— ...	4 ...	—

The next table gives the comparative sick rate of officials and the average length of time each case was kept on the sick list for the last three years :—

EUROPEAN AND NATIVE OFFICIALS.

	1907	1908	1909
Total number on sick list	97	116	108
Total number of days	461	630	509
Average daily number on sick list...	1.26	1.72	1.36
Average length of time on sick list	4.75	5.43	4.71

EUROPEAN OFFICIALS.

	1907	1908	1909
Total number on sick list	14	19	20
Total number of days	78	121	101
Average daily number on sick list. .	.21	.33	.27
Average length of time on sick list	5.57	6.66	5.05

NATIVE OFFICIALS.

	1907	1908	1909
Total number on sick list	83	97	88
Total number of days	383	509	408
Average daily number on sick list..	1.05	1.39	1.11
Average length of time on sick list	4.61	5.24	4.63

SMALL-POX.

The Colony and Protectorate were particularly free from small-pox this year. There were no cases in the Colony, and as far as one can ascertain only two cases occurred in the Protectorate, at a small town in Kommbo named Tunjina.

The usual precautions were taken, and over 400 vaccinations were done at this place, and the disease did not spread.

The travelling commissioners and the Protectorate medical officer have again been at great pains in vaccinating children all over the Protectorate, and no less than 2,517 vaccinations have been done this year by them. The results, so far as they can be examined, are most satisfactory from the lymph obtained from the Incorporated Liverpool Institute of Comparative Pathology sent out from England on ice and transmitted to the Protectorate in well-constructed and protected boxes for preserving its activity.

In Bathurst it is possible to verify results, and out of 895 vaccinations only seven are reported as failures.

RETURN OF VACCINATIONS.

Months	Total vaccinated	Successes	Failures
January ...	74 ...	74 ...	—
February ...	68 ...	68 ...	—
March	60 ...	53 ...	7
April	80 ...	80 ..	—
May	72 ...	72 ...	—
June	104 ...	104 ...	—
July	112 ...	112 ...	—
August ...	158 ...	158 ...	—
September ...	51 ...	51 ...	—
October ...	82 ...	82 ...	—
November ...	14 ...	14 ...	—
December ...	20 ...	20 ...	—
Total	895 ...	888 ...	7

Total number of persons vaccinated in the Protectorate ... 2,517

QUARANTINE.

During the outbreak of bubonic plague on the Gold Coast all ships arriving from the south were visited by the health officer for inspection purposes, but it was not found necessary to impose any quarantine formalities on any ships calling at this port.

SANITATION OF BATHURST.

The sanitation of Bathurst is under the control of the Board of Health, which consists of the senior medical officer, chairman, and the colonial engineer, *ex-officio*, and not more than six members appointed by the governor.

DISPOSAL OF REFUSE AND SEWAGE.

1,333 cartloads of refuse were taken from the town to the dumping grounds outside; tins and bottles were collected and broken at intervals and then buried after the refuse had been burnt.

Sewage is to some extent taken to the river in pails, but cesspits are still very prevalent in Bathurst, there being nearly 500 of them, and very few, if any, are properly constructed.

During the year 453 yards and compounds were inspected, and 150 abatement notices were served. Five convictions were obtained against persons committing offences under the Public Health Ordnance.

A new public latrine, screened by shrubs, has been erected on a plot of land purchased for the purpose, towards the northern end of the town, and has proved most useful in keeping the streets cleaner in that area; the other eight public latrines are on the outskirts of Bathurst, and for the most part are erected over the water and are too far away for many people to use. The provision of more accommodation is desirable at convenient points, and the closing of private cesspits ought to be seriously taken in hand.

WATER SUPPLY.

The water supply of Bathurst is far from satisfactory. Europeans and a few of the better class natives possess tanks for the conservation of rain water. The majority of the people depend for their supplies on shallow surface wells, of which there are in Bathurst over 600 constructed in a very primitive manner, and more often than not sunk only a few yards from a percolating cesspit.

It is apparently impossible to obtain a water supply from a distance, but the roofs of public buildings in

the town would afford an ample collecting area and should be utilized for this purpose.

Surface Drainage.

The surface drainage is bad during the rainy season on account of the low level, and cannot be rectified except by filling in a great part of the town at an enormous cost. Fortunately, after the rains the water soon disappears, on account of the porous nature of the soil, and every effort is made to keep the drains free of water by raising the sluice gates when the tide is low and closing them again when the tide begins to rise. During the rainy season the ground is waterlogged, and very extensive pools are unavoidable.

Anti-Malarial Work.

Mosquito Breeding Places.—The Board of Health has kept this in view during the year, and the inspectors of nuisances devote much of their time in superintending the filling up of depressions, the clearing of watercourses, and the collecting, removing and breaking up of waste bottles and tins.

The masonry drains that contain water, even throughout the dry season, are regularly swept out every week and treated with saprol. It has been found that oiling the surface is useless, as the prevailing wind drives the oil before it and leaves the water uncovered.

The inhabitants are urged, but with little effect, to keep their wells and the vessels they use for storing their daily water supplies covered. When the new Public Health Ordinance becomes law it will be possible to deal with people who are careless in this respect and who allow larvæ to develop on their premises.

Quinine.—A grant of £50 was made this year for the free distribution of quinine and nearly 22,000 doses, varying from 3 gr. to 5 gr., have been administered and for the most part to school children. The schools were visited weekly by a dispenser with supplies of quinine mixture and the distribution takes place before the children leave. The police, the frontiers and their wives and families, and the prisoners have all had quinine regularly since the rains, and the fact that it is taken willingly shows that its value is appreciated.

Protection from mosquitoes.—Of the 151 Europeans who have resided in the Colony during the year, not one, so far as I can gather, slept at night-time outside a mosquito house or net; protection at night-time being now regarded as essential.

The question of providing mosquito proof accommodation in Government quarters for the use of officers in the day-time is now under consideration.

Lectures.—Another course of lectures on Elementary Hygiene and Sanitation, followed by an examination, was delivered during the year to school teachers, but the attendance was poor and irregular and only two certificates were awarded.

The Home for the Afflicted and Destitute.

At a comparatively small cost a Home to accommodate afflicted and destitute persons has been erected on the northern outskirt of the town in a pleasant and open situation, and was opened on June 12th.

Buildings.—The main building consists of two airy wards, and the usual outbuildings and an attendant's quarters have been provided.

The compound is divided and surrounded by an iron fence, and the ornamental trees and shrubs that have been planted will soon give sufficient shade and privacy for the inmates.

Inmates.—During the year, six males and seven females were admitted. Two males died and one was taken away by relatives to be cared for.

Food.—The food supplies are prepared and sent daily from the Victoria Hospital.

Water.—Two 400-gallon tanks have been placed in the compound to collect rain water for drinking purposes from the roof of the main building. This supply is insufficient.

A well has been sunk in the compound on the male side, only the water is too brackish and cannot be utilized to any great extent; fortunately there is a good public well within a hundred yards of the Home and the able-bodied inmates obtain sufficient supplies from it.

Sanitation.—The premises are regularly cleaned and swept, and the Board of Health labourers remove all refuse and cleanse the latrines daily.

Attendance.—A senior native nurse has been transferred from the Victoria Hospital as attendant to the Home and occupies the quarters provided.

Sex	Admitted	Discharged	Died	Remaining
Males	6	1	2	3
Females	7	—	—	7
Total	13	1	2	10

Causes of deaths.—Exhaustion following diarrhœa, 1; senile decay, 1; total 2.

Meteorological Station.

A station of the second order is maintained at Bathurst and observations have been regularly made at the Victoria Hospital.

Considerably more rain fell during the year than in the two previous years. In 1907 there was a fall of 30.33 in. only, and in 1908 35.89 in.; this increase in 1909 does not appear to have had any effect on the general health of the people.

	Temperatures					Rainfall	Winds
Months	Minimum on grass	Shade maximum	Shade minimum	Range	Mean	Amount in inches	General direction
January	46	92	47	45	73.0	—	East
February	42	98	47	51	73.5	—	North
March	41	105	61	44	77.0	—	,,
April	52	93	63	30	74.6	—	,,
May	57	99	61	38	77.2	—	,,
June	62	99	66	33	79.8	6.13	Variable
July	58	99	71	28	81.0	8.87	,,
August	60	89	69	20	80.5	19.89	,,
September	62	91	69	22	80.6	17.30	,,
October	65	92	66	26	83.5	4.40	,,
November	55	91	66	25	78.9	—	East
December	51	95	61	34	77.8	—	,,
Total	651	1,143	747	396	934.4	56.59	
Monthly av.	54.2	95.2	62.2	33	77.8	11.31	

Colonial Medical Reports—No. 5.—Colony of the Gambia—*(continued)*.

RETURN OF DISEASES AND DEATHS IN 1909 AMONGST EUROPEANS AND NATIVES IN THE VICTORIA HOSPITAL,

Colony of the Gambia.

GENERAL DISEASES.

	Europeans		Natives		
	Admissions	Deaths	Admissions	Deaths	Total Cases Treated
Alcoholism	1	—	1	—	2
Anæmia	—	—	2	1	2
Anthrax	—	—	—	—	—
Beri-beri	—	—	1	—	1
Bilharziosis	—	—	—	—	—
Blackwater Fever	—	—	—	—	—
Chicken pox	—	—	—	—	—
Cholera	—	—	—	—	—
Choleraic Diarrhœa	—	—	—	—	—
Congenital Malformation	—	—	—	—	—
Debility	—	—	13	4	13
Delirium Tremens	—	—	—	—	—
Dengue	—	—	—	—	—
Diabetes Mellitus	—	—	—	—	—
Diabetes Insipidus	—	—	—	—	—
Diphtheria	—	—	—	—	—
Dysentery	—	—	1	—	1
Enteric Fever	—	—	—	—	—
Erysipelas	—	—	1	1	1
Febricula	—	—	—	—	—
Filariasis	—	—	—	—	—
Gonorrhœa	1	—	13	—	14
Gout	—	—	—	—	—
Hydrophobia	—	—	—	—	—
Influenza	—	—	—	—	—
Kala-Azar	—	—	—	—	—
Leprosy	—	—	—	—	—
(*a*) Nodular	—	—	—	—	—
(*b*) Anæsthetic	—	—	—	—	—
(*c*) Mixed	—	—	—	—	—
Malarial Fever—	—	—	—	—	—
(*a*) Intermittent	1	—	—	52	53
Quotidian	—	—	—	—	—
Tertian	—	—	—	—	—
Quartan	—	—	—	—	—
Irregular	1	—	—	—	1
Type undiagnosed	—	—	—	—	—
(*b*) Remittent	12	2	6	1	18
(*c*) Pernicious	—	—	—	—	—
(*d*) Malarial Cachexia	—	—	—	—	—
Malta Fever	—	—	—	—	—
Measles	—	—	—	—	—
Mumps	—	—	—	—	—
New Growths—	—	—	—	—	—
Non-malignant	—	—	—	—	—
Malignant	—	—	1	1	1
Old Age	—	—	—	—	—
Other Diseases	—	—	—	—	—
Pellagra	—	—	—	—	—
Plague	—	—	—	—	—
Pyæmia	—	—	1	1	1
Rachitis	—	—	—	—	—
Rheumatic Fever	—	—	—	—	—
Rheumatism	—	—	42	—	42
Rheumatoid Arthritis	—	—	—	—	—
Scarlet Fever	—	—	—	—	—
Scurvy	—	—	—	—	—
Septicæmia	—	—	1	1	1
Sleeping Sickness	—	—	—	—	—
Sloughing Phagedæna	—	—	—	—	—
Small-pox	—	—	—	—	—
Syphilis	—	—	—	—	—
(*a*) Primary	—	—	—	—	—
(*b*) Secondary	—	—	—	—	—
(*c*) Tertiary	—	—	—	—	—
(*d*) Congenital	—	—	—	—	—
Tetanus	—	—	—	—	—
Trypanosoma Fever	—	—	—	—	—
Tubercle—	—	—	2	2	2
(*a*) Phthisis Pulmonalis	—	—	—	—	—
(*b*) Tuberculosis of Glands	—	—	—	—	—
(*c*) Lupus	—	—	—	—	—

	Europeans		Natives		
	Admissions	Deaths	Admissions	Deaths	Total Cases Treated
GENERAL DISEASES—*continued*.					
(*d*) Tabes Mesenterica	—	—	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—	—	—
Other Tubercular Diseases	—	—	—	—	—
Varicella	—	—	—	—	—
Whooping Cough	—	—	—	—	—
Yaws	—	—	—	—	—
Yellow Fever	—	—	—	—	—

LOCAL DISEASES.

Diseases of the—					
Cellular Tissue	3	—	—	29	32
Circulatory System—	—	—	—	—	—
(*a*) Valvular Disease of Heart	—	—	4	1	4
(*b*) Other Diseases	—	—	2	—	2
Digestive System—	—	—	—	—	—
(*a*) Diarrhœa	—	—	14	—	14
(*b*) Hill Diarrhœa	—	—	—	—	—
(*c*) Hepatitis	—	—	—	—	—
Congestion of Liver	—	—	—	—	—
(*d*) Abscess of Liver	—	—	—	—	—
(*e*) Tropical Liver	—	—	—	—	—
(*f*) Jaundice, Catarrhal	—	—	—	—	—
(*g*) Cirrhosis of Liver	—	—	3	2	3
(*h*) Acute Yellow Atrophy	—	—	—	—	—
(*i*) Sprue	—	—	—	—	—
(*j*) Other Diseases	4	—	85	2	89
Ear	—	—	1	2	1
Eye	—	—	30	—	30
Generative System—	—	—	—	—	—
Male Organs	1	—	—	20	21
Female Organs	—	—	—	19	19
Lymphatic System	1	—	8	—	9
Mental Diseases	—	—	—	—	—
Nervous System	1	1	8	1	9
Nose	—	—	3	—	3
Organs of Locomotion	2	—	—	17	19
Respiratory System	2	—	45	7	47
Skin—	—	—	—	—	—
(*a*) Scabies	—	—	—	—	—
(*b*) Ringworm	—	—	—	—	—
(*c*) Tinea imbricata	—	—	—	—	—
(*d*) Favus	—	—	—	—	—
(*e*) Eczema	—	—	—	5	5
(*f*) Other Diseases	2	—	—	97	99
Urinary System	—	—	9	—	9
Injuries, General, Local—	—	—	—	—	—
(*a*) Siriasis (Heatstroke)	—	—	—	—	—
(*b*) Sunstroke (Heat Prostration)	1	—	—	—	1
(*c*) Other Injuries	—	—	62	2	62
Parasites—	—	—	13	—	13
Ascaris lumbricoides	—	—	—	—	—
Oxyuris vermicularis	—	—	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	—	—	—	—	—
Filaria medinensis (Guinea-worm)	—	—	—	—	—
Tapeworm	—	—	1	—	1
Poisons—	—	—	—	—	—
Snake-bites	—	—	—	—	—
Corrosive Acids	—	—	—	—	—
Metallic Poisons	—	—	—	—	—
Vegetable Alkaloids	—	—	—	—	—
Nature Unknown	—	—	—	—	—
Other Poisons	—	—	—	—	—
Surgical Operations—	—	—	—	—	—
Amputations, Major	—	—	—	—	—
,, Minor	—	—	—	—	—
Other Operations	—	—	—	—	—
Eye	—	—	—	—	—
(*a*) Cataract	—	—	—	—	—
(*b*) Iridectomy	—	—	—	—	—
(*c*) Other Eye Operations	—	—	—	—	—

The Prison.

The daily average number of prisoners was 20.33 during the year.

The health of the prisoners has on the whole been good; 21 were admitted to the Infirmary and one patient died from beri-beri and one homicidal maniacal convict, a Spaniard, was transferred to Broadmoor.

Sanitation was well maintained, the whole establishment having been kept scrupulously clean.

The cells on the ground floor, which are cold and dark and not too well ventilated, are only occupied on rare occasions and then by short-time prisoners.

The prisoners' diet has been improved, rice being used as little as possible.

The water supply was ample and of good quality.

In the prison infirmary 21 in-patients and 138 out-patients were treated during the year.

General.

The Market.—The Board of Health has maintained the Market in a sanitary condition and the new galvanized iron sanitary bins have been found very useful.

The Slaughter-house.—All the iron work has been scraped and coated with a preparation of tar and cement. The whole structure is in order and in an excellent position over the river.

Fresh Meat.—A medical officer inspects the fresh meat in the Market daily. Except on two occasions it has been found in good condition.

The fly-proof room has been kept in repair and the stalls are lime-washed at frequent intervals.

Wells.—Two new public wells have been sunk and fitted with Jeyes' Patent elevators—contrivances which absolutely prevent contamination of the water and the entrance of mosquitoes.

Rats.—Attempts were made to reduce the number of rats in Bathurst when plague was reported on the Gold Coast, but without success.

Rat virus was imported on several occasions but proved useless.

The Government encouraged trapping by offering a penny a rat, but during six months only 1,200 rats were caught and paid for.

Owing to the ground-nut trade it is almost impossible to cut off the food supplies of rats in Bathurst, and the only practical method of keeping them under seems to be by cats and regular attention to the stores when they are empty.

Entomological Collections.—Collections of blood-sucking flies and ticks have been made in the Colony and Protectorate and despatched to the British Museum and the new Museum at Cambridge, and reports on them have been received.

The *Glossina morsitans* was found for the first time in Gambia.

The Victoria Hospital.

No structural alterations have been made during the year, but all the buildings have been kept in good repair.

Sixteen new beds with bedding have replaced sixteen old ones transferred to the Home for Destitutes.

A police ambulance and an invalid chair have been provided to convey sick persons to hospital and are a great convenience.

The contractors for food supplies and ice have given every satisfaction and the patients appreciate the more generous diet provided.

During the year there were 666 admissions to hospital, an increase of 73 over those of 1908—and there were 7,324 new cases seen in the out-patient rooms compared with 6,716 last year. These figures show that the confidence of the natives in the Institution is not decreasing.

The introduction of a scale of fees, payable by out-patients who can afford to pay, has not interfered with the usefulness of the department. Fifty-eight patients during the last six months of 1909 have paid either 3d., 6d., or 1s. each for medicine.

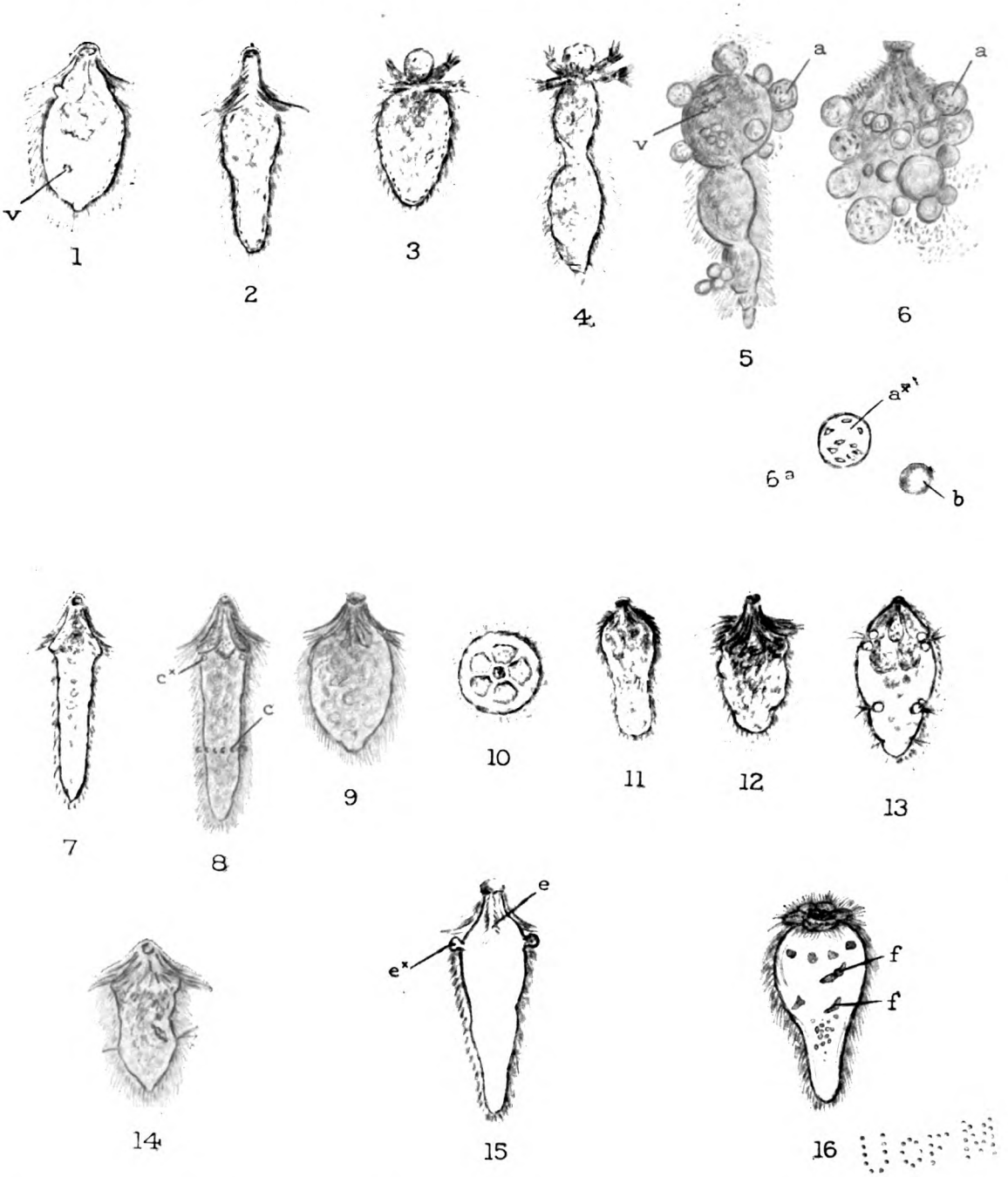
I attach the various tables of statistics and the report of Dr. Hopkinson in regard to medical work in the Protectorate.

Prevailing Diseases of In-Patients during the Year.

Ulcers	82
Injuries	67
Intermittent Fever	55
Rheumatism	42
Dyspepsia	38
Abscess	31
Bronchitis	28
Conjunctivitis	24
Constipation	16
Gonorrhœa	16
Debility	13
Hernia	12
Colic	10
Pneumonia	10

Surgical operations performed under chloroform during the year, 46.

Surgical operations performed with a local anæsthetic during the year, 40.



To illustrate a paper "On Numerous Cases of Œdema of the Legs and Albuminuria occurring in a Reformatory; and a Contribution to Bilharziasis." By E. F. Bour, Acting Government Medical Officer, Mauritius.

Explanation of Plate.

1, miracidium; 2, 3, 4, 5 are the changes observed in a same miracidium, immersed in human serum; 6, depicts another one at the same stage of evolution as 5; a, sporocyst; 6a, a×, sporocyst under high power, with b (blood corpuscle); v, pulsatile vacuole found pulsating after miracidium had been three hours in serum, and for that time apparently motionless; 7, 8, miracidium in NaCl solution $\frac{8}{1000}$ where it died in one to three minutes—c, tubules, possibly sporocysts pores. arranged in a ring around the body of the miracidium, c×, possibly sporocyst pores; 9, miracidium, dead in soapsuds; 10, seen endways (note the rose-like arrangement of the rostrum, and compare with the rostrum in 8); 11, miracidium in perchloride of mercury solution $\frac{1}{1000}$; death at contact; 12, miracidium in saliva; 13, miracidium, dead in water after the ovum had been in a $\frac{1}{1000}$ sol. of hydrarg. perchlor. for $\frac{1}{2}$ minute; 14, miracidium, dead after 30 minutes in the juice of the water snail (*limnæ*); 15, miracidium in the juice of the edible snail, altering into 16, after one hour (e, ciliated fold, e×, possibly sporocysts pores, f, hyaline spaces with changing contours).

Colonial Medical Reports.—No. 6.—Straits Settlements.

MEDICAL REPORT FOR THE YEAR 1909.

By W. GILMORE ELLIS.

Principal Civil Medical Officer.

Population and Health.

THE following table shows the estimated population and the birth and death-rates for the years 1908 and 1909 :—

Settlement	Estimated mean Population		Births		Deaths		Birth Ratio per mille		Death Ratio per mille	
	1908	1909	1908	1909	1908	1909	1908	1909	1908	1909
Singapore	271,060	277,658	6,084	6,196	12,726	10,779	22.45	22.31	46.95	38.82
Penang	133,067	133,697	2,942	2,706	5,738	5,006	22.10	20.24	43.12	37.44
Province Wellesley	121,219	122,216	4,328	3,880	3,627	3,627	35.79	31.74	29.87	31.28
Dindings	4,532	4,594	185	169	251	232	40.82	36.79	55.58	50.50
Malacca	98,138	98,526	4,535	4,043	4,699	4,085	46.21	41.03	47.88	41.46
Total	628,016	636,691	18,074	16,994	27,041	23,925	28.75	26.69	43.06	37.58

The mean estimated population, which for 1901 calculated from the Census returns was 572,249, is estimated at 636,691 for 1909. The increase is mechanical, based entirely on the increase between the Census figures of 1891 and 1901, the natural means of estimating on the number of births and deaths and immigration and emigration not being practicable on account of records for the latter not being reliable.

The birth-rate has declined in all the Settlements.

The death-rate is the lowest registered since 1899. The deaths occurring within the Singapore Municipal limits, which were 10,943 in 1907 and 11,238 in 1908, were 9,440 in 1909, giving a rate of 38.56 per mille, compared with 46.78 in 1908.

Of the number of deaths registered in 1909, 4,714 were among infants under one year of age, which represents a percentage of 19.7 of the total. The deaths amongst infants for the years 1908 and 1907, respectively, were 5,110 and 4,339. The ratio per mille for 1909, after excluding the births of children born elsewhere than in the Colony, was 263.67, against 265.63 in the previous year. Of the 4,714 infant deaths registered 3,082 are returned as due to "convulsions."

There has been but little advance made with regard to a midwives' Bill during the year. We are gradually training some native women in the maternity wards of the General Hospital. These wards are slowly increasing in favour amongst the Chinese, and with more material the work will, I trust, progress satisfactorily and bear fruit in the future.

The following table gives the number of cases of zymotic diseases in the several Settlements in the years 1908 and 1909, and deaths therefrom, not including cases imported into the Colony.

Plague.

Of the 5 cases reported 4 were Chinese and 1 a Tamil. All the cases occurred in the Chinese quarters of the town. Two of the cases were discovered after death. In no case could the source of infection be traced.

Cholera.

This disease broke out in Singapore in August, 1908, and continued until the end of February, 1909. After about 6 weeks of freedom there was a recrudescence which assumed epidemic form, continuing up to the middle of May. The last case reported occurred on September 14. Altogether there were 84 cases, of which 76 ended fatally. The outbreak was confined to the Settlement of Singapore.

Settlement	Plague				Cholera				Small-pox			
	1908		1909		1908		1909		1908		1909	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Singapore	12	12	5	5	134	121	84	76	26	10	41	8
Penang	—	—	—	—	—	—	—	—	5	2	—	—
Province Wellesley	—	—	—	—	64	57	—	—	—	—	21	3
Malacca	—	—	—	—	—	—	—	—	—	—	—	—
Total	12	12	5	5	198	178	84	76	31	12	62	11

Small-pox.

In Singapore there were 41 cases notified with 8 deaths, compared with 26 in 1908 with 10 deaths. In Province Wellesley there were 21 cases with 3 deaths, the infection probably being introduced from Kedah. All contacts were vaccinated.

Diphtheria.

Ten cases were notified as against 13 in 1908 and 18 in in 1907. All the cases were children, of whom 1 was European, 2 were Eurasians, 6 Chinese and 1 Jew. Two cases ended fatally.

Enteric Fever.

There were 235 cases notified in Singapore, compared with 247 in 1908 and 353 in 1907, of these 89 cases ended fatally. In Penang 15 deaths were returned under this head, in Province Wellesley and Malacca none. As stated in the previous year's report, the figures for typhoid cannot be relied upon as many cases are probably included under "Fever Unspecified."

Beri-beri.

1,506 deaths were registered under this head. The following table gives the figures for the last five years:—

Deaths from Beri-beri.

	1904	1905	1906	1907	1908	1909
Singapore ...	1,621	1,233	998	1,213	1,117	873
Penang ...	307	291	282	212	534	399
Province Wellesley ...	75	70	6	9	20	11
Dindings ...	—	3	3	5	2	4
Malacca ...	284	291	218	187	227	219
Total ...	2,287	1,888	1,507	1,626	1,900	1,506

The following are the figures of all cases treated in the various hospitals for the years 1906, 1907, 1908, and 1909:—

Year.	Total cases.	Deaths.	Percentage of Deaths
1906 ...	1,971	296	15.01
1907 ...	1,806	243	13.45
1908 ...	2,777	284	10.23
1909 ...	2,118	224	10.57

The results from the use of parboiled rice continue to give satisfaction and the native patients at the several hospitals are exclusively fed on cured rice.

The returns from the Pasir Panjang Beri-beri Hospital show 383 cases treated, of whom 181 were discharged cured and but 1 died of the disease.

Work on the etiology of this disease has been in progress throughout the year at the Research Institute, Kuala Lumpur, under Dr. Fraser, and a despatch has already been sent through the High Commissioner to the Secretary of State giving cover to a booklet recording the results. In the present state of our knowledge it has not been found possible to advise Government as to any legislative measures of a preventive nature, although the results of work at many different laboratories point that this must soon come.

Venereal Diseases.

The admission to all hospitals in 1909 were 2,603 with 49 deaths. In 1908 there were 2,114 with 55 deaths and in 1907, 2,460 admissions with 46 deaths. Of the admissions in 1909, 231 were prostitutes.

Phthisis.

Deaths registered from this cause numbered 2,659, against 2,988 and 2,820 in 1908 and 1907 respectively. This high mortality is likely to continue until some practical measures are put in force in the larger towns to lessen overcrowding, improve ventilation and remove advanced cases. The mortality in Penang was 901 as compared with 917 in 1908.

Dysentery and Diarrhœa.

There were 1,241 and 515 deaths, respectively, from these causes as against 1,394 and 638 in 1908. 2,458 cases were admitted into the hospitals of the Colony, of whom 796 died, compared with 2,437 cases with 889 deaths in 1908. Patients generally come for admittance to hospital in the last stages of these diseases when treatment is unlikely to be of much avail and consequently a high death-rate is to be expected.

Malaria.

There is no doubt that the figures under this head except from hospitals are unreliable. The diagnosis of native unqualified practitioners cannot be accepted and the Registrars of Deaths can hardly be expected to come to correct conclusions in many cases without *post-mortem* examinations. As pointed out by the Singapore Municipal Health Officer it is probable that in a large number of those suffering within the Municipality primary attacks were contracted elsewhere than in Singapore. There were 2,589 deaths during the year, of which 1,670 occurred in Singapore. In 1908 there were 3,062, of which 2,100 were in Singapore. During the year the following works were carried out as preventive measures:—

In Singapore.—Filling up swampy ground in Lock Hospital compound. Filling up low land near Pearl's Hill. Clearing land at St. John's Island. The Singapore Municipality continued to issue notices to fill or drain collections of water, to oil pools, for the destruction of receptacles containing unused water, such as barrels, oil-tins and broken bottles in the neighbourhood of dwellings. The persistent habit of the natives who, provided with a continuous water supply, continue to store water in jars which remains stagnant and often breeds mosquitoes, is being actively combated.

In Penang.—The filling in of low-lying spots at the Quarantine Station, Brick Kiln Road, District Hospital, by Northam Road, by Perak Road, and the compound of deputy engineer's house. The municipality maintained a gang of coolies cleaning ditches, draining ponds, oiling ponds, and removing old tins, jars and other receptacles. A considerable area of low-lying lands were filled up by the owners under nuisance notices. Several masonry drains were extended. The Rural Boards of Penang, Province Wellesley and Dindings are doing good work in constructing, maintaining and extending concrete drains and in draining, filling or oiling ponds and swampy ground in the immediate vicinity of the villages.

Sanitation.

The improvements referred to in last year's report were continued in 1909. The back-lane scheme for Sultan Ali's estate has been nearly completed. A scheme for the improvement of Kampong Kapur has been suggested and the preparation of the estimates of cost taken in hand. Schemes for back-lanes in other portions of Singapore town have been approved. The question of sewage disposal in Singapore is not yet finally settled. An expert from home was called in during the year and his report is under consideration.

Ankylostomiasis.

There were in all 335 cases admitted to the different hospitals in 1909 as compared with 192 in 1908. The deaths due to this disease numbered 80 and 51, respectively, for the two years referred to.

Colonial Medical Reports.—No. 6.—Straits Settlements—(*continued*).

In consequence of a despatch from the Secretary of State, circulars were issued early in the year to estate managers urging the strict enforcement of all rules bearing on sanitation. The following points were considered: (1) Latrine accommodation; (2) Defæcation in unauthorized places; (3) Supervision by estate medical officers; (4) The issue of leaflets to the general public; (5) The distribution of anthelmintics.

The leaflets were distributed about the end of the year; they were on the lines of those issued by the Government of Dominica as prepared by Dr. Ashford Nicholls.

making a total of 383 treated. Of the seven deaths, but one was due to beri-beri.

Police Force.

In Singapore 3,924 out-patients were attended to, as compared with 4,454 in 1908. Three hundred and eighty-eight were ordered to hospital as against 512 in 1908, the majority of the cases being sent for malarial fever. Three hundred and six candidates for the force came up for examination, of whom 110 were rejected.

Estates.

Five thousand three hundred and two cases were

Hospitals and Work Done.

Year	Number of patients treated: Europeans	Natives	Total	Number of Deaths: Europeans	Natives	Total	Percentage of deaths to total treated: Europeans	Natives	Total
(*a*) 1907	1,193	27,515	28,708	74	3,614	3,688	6.20	13.13	12·85
(*b*) 1908	1,287	29,083	30,370	83	3,948	4,031	6.45	13.57	13.24
(*c*) 1909	1,398	28,868	30,266	70	3,565	3,635	5.01	12.35	12.01

Includes Lunatic Asylum:—(*a*) 483 cases and 57 deaths. (*b*) 508 cases and 65 deaths. (*c*) 556 cases and 78 deaths.

The diseases responsible for the greatest number of admissions and deaths are shown in the subjoined tables with the corresponding diseases and deaths in 1908:—

Disease	1908: Total treated	1908: Deaths	1909: Total treated	1909: Deaths
Malarial Fever	4,587	504	5,183	331
Dysentery	1,452	658	1,743	670
Diarrhœa	909	229	714	126
Beri-beri	2,777	284	2,118	224
Tuberculosis (including Phthisis)	1,032	601	1,080	541
Anæmia and Debility	792	168	626	117
Pneumonia	282	140	337	152
Enteritis	195	35	137	24
Enteric Fever	243	96	316	79
Venereal Diseases	2,114	55	2,603	49
Pyrexia	683	4	671	3
Bronchitis	435	17	410	19
Ulcers	2,116	—	2,807	19

Lunatic Asylum.

The total number treated was 556 (453 males and 103 females), against 508 in 1908. The recovery rate of 42.27 per cent. on the admissions against 30.19 in 1908 is very satisfactory. The death-rate was 22.69 on the average daily number of residents. Three hundred and fifty-one patients remained at the end of the year.

Maternity Wards, General Hospital.

The total admissions were 173, as compared with 143 in 1908 and 105 in 1907. This small increase is gratifying to note, and as these wards become better known it is to be hoped they will fulfil a long-felt want by providing sufficient material for the training of midwives.

Beri-beri Hospital, Pasir Panjang.

One hundred and twelve patients remained over from 1908, and 271 were admitted during the year,

admitted into the estate hospitals in Province Wellesley during 1909, as against 6,182 and 4,874 in 1908 and 1907 respectively. The admissions were largely for bowel disorders and fever. There were 135 deaths in 1909, compared with 72 in 1908 and 112 in 1907.

Out-door Dispensaries.

Twenty-seven thousand one hundred and thirty-four patients were treated at the different dispensaries, against 25,497 in 1908. The figures do not include out-patients treated by the police surgeon in Singapore.

The building of a new out-door dispensary in Singapore in a more central part of the town has been sanctioned for 1910, and a site in North Canal Road has been selected for the purpose.

Vaccination.

The total number of vaccinations performed throughout the colony in 1909 was 12,854, against 14,843 in 1908. The following table shows the number vaccinated (exclusive of those performed in the prisons and quarantine station and by private medical practitioners), with the results in the several Settlements during 1909:—

Settlement	Number of Vaccinations performed	Result: Perfect	Modified	Failed	Not seen
Singapore (*a*)	2,533	2,533	Nil.	Nil.	Nil.
Singapore (*b*)	1,870	1,791	5	10	64
Penang	3,020	2,670	267	32	51
Province Wellesley	3,795	3,440	179	154	22
Dindings	153	146	Nil.	7	Nil.
Malacca	3,133	3,082	25	25	1
Total	14,504	13,662	476	228	138

(*a*) By Government Vaccinator. (*b*) By Licensed Vaccinators.

Quarantine.

The numbers of passengers and crew examined on

arrival in Singapore were 214,321 and 77,304 respectively, against 220,527 and 82,957 in the previous year.

Nine outgoing pilgrim ships with 5,337 pilgrims were examined on departure, as against 10 ships with 5,712 in 1908.

In Penang 118,836 passengers (including 4,027 outgoing pilgrims) and 43,135 crew were examined, of these 23,058 passengers were detained on the Quarantine Island for observation.

The stations both at Singapore and Penang were in continuous use throughout the year.

Government Analyst's Department.

The work of the department is still increasing. There is, however, a fall in the revenue of $1,020, compared with 1908, owing to a decrease in the amount of petroleum oil in bulk imported at Pulau Bukom works.

The new office of deputy Government analyst in Penang was opened on the 1st June and $2,189.54 was collected to the end of the year.

Medical School.

There are now 72 full course students, compared with 58 in 1908, studying for L.M.S. diploma, of whom 17 are in their fifth year. Four students were allowed to resign, of whom one left for Europe to continue his studies. A considerable number of new books and apparatus were purchased during the year, and many additions made to the museum. The extension of the present building to provide a reading room, museum and class-room is under consideration.

Pathological Work.

The new bacteriological laboratory and the morgues at Sepoy Lines and Tan Tock Seng's were completed and taken over in the early part of the year. The large amount of routine work such as all *post mortems*, blood and water examinations, bacteriological examinations, classes in connection with the medical school, leaves the pathologist no time for the prosecution of work in the nature of original research. This is regrettable. With the training of a suitable student from the school as pathological assistant it is hoped the necessary leisure will be available at no distant date. 1,278 autopsies were performed at the Tan Tock Seng's Hospital mortuary and 264 at Sepoy Lines.

Medical Department, Labuan.

No epidemic nor infectious diseases occurred on the island during the year. The birth-rate and death-rate per mille stands at 22.23 and 23.93, against 20.82 and 25.83 respectively, in 1908. The total number of patients treated in the hospital was 307, as against 167 and 183 in 1908 and 1907. The chief diseases treated were malaria, beri-beri and venereal diseases. A new ward for females was added during the year.

Miscellaneous.

(*a*) Eight certificates as chemists were issued during the year under the Deleterious Drugs Ordinance, and 45 licences for either wholesale or retail or both were issued under the Poisons Ordinance in Singapore, 14 in Penang, and 4 in Malacca.

(*b*) One hundred and ninety-eight medical practitioners stood on the register on the 31st December; of these 119 are in the service of the Straits and Federated Malay States Governments, the others being in private practice.

(*c*) Two colonial apprentices from the Madras Medical College arrived during the year and were examined at the Medical School. One passed.

(*d*) One probationer passed out during the year from the Maternity Hospital, bringing the total number of certificated midwives to 14.

APPENDICES.

Singapore.

General Hospital.

(Report by Dr. J. Leask, Senior Medical Officer-in-charge.)

The private European male wards were well filled during the year. On several occasions patients had to wait in the general wards until there was a vacant bed in the private wards. The daily average was 10.23 patients for 16 beds.

The European male general wards were well filled on some occasions, the greatest numbers being in February, May, June and September.

The daily average was 19 patients for 35 beds.

The European female private wards had a daily average of 1.82 for 8 beds.

The European female general wards had a daily average of 4.73 patients for 9 beds.

The maternity wards had a daily average of 3.15, European patients for 13 beds, and 2.59 natives for 16 beds.

The native female wards were frequently overcrowded during the year, having a daily average of 14.18 patients for 18 beds.

The native male wards were also frequently full during the period from the middle of March to the end of November.

The daily average was 122.28 patients for 204 beds.

As certain wards were more crowded than others the overcrowding was more serious than is shown by these figures.

There were 3,975 admissions to the whole hospital (534 of whom were females), against 4,233 (of whom 376 were females) in 1908.

The total treated during 1909 was 4,104, against 4,370 in 1908; and the average daily sick was 178.10, against 168.04 in 1908.

There were 289 deaths (39 of these in females), against 377 in 1908.

The percentage of deaths to total treated was 7.04, against 8.6 in 1908 and 8.716 in 1907, thus showing a steady decrease.

European Wards.

There were 770 admissions to the European wards

RETURN OF DISEASES AND DEATHS IN 1909 AT THE FOLLOWING INSTITUTIONS:—

General Hospital, Prison, St. John's Island; Tan Tock Seng's Hospital, Quarantine Camp; Leper, Beri-beri and Lock Hospitals and Lunatic Asylum, Singapore, Straits Settlements.

GENERAL DISEASES.	Admissions	Deaths	Total Cases Treated*
Alcoholism	27	—	28
Anæmia	139	19	148
Anthrax	—	—	—
Beri-beri	1,047	129	1,253
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	60	—	60
Cholera	25	19	26
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	—	—	—
Delirium Tremens	—	—	—
Dengue	13	—	13
Diabetes Mellitus	3	1	3
Diabetes Insipidus	—	—	—
Diphtheria	3	1	3
Dysentery	952	392	973
Enteric Fever	194	74	205
Erysipelas	12	1	13
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	248	—	261
Gout	1	—	1
Hydrophobia	—	—	—
Influenza	—	—	—
Kala-Azar	—	—	—
Leprosy	57	12	79
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	—	—	—
(*c*) Mixed	—	—	—
Malarial Fever—	189	7	189
(*a*) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	1,738	232	1,749
Quartan	8	1	8
Irregular	—	—	—
Type undiagnosed	1,154	64	1,205
(*b*) Remittent	—	—	—
(*c*) Pernicious	—	—	—
(*d*) Malarial Cachexia	—	—	—
Malta Fever	—	—	—
Measles	20	—	21
Mumps	12	—	14
New Growths—	—	—	—
Non-malignant	28	1	31
Malignant	50	27	51
Old Age	—	—	—
Other Diseases	676	145	684
Pellagra	—	—	—
Plague	3	3	3
Pyæmia	9	4	9
Rachitis	—	—	—
Rheumatic Fever	51	—	57
Rheumatism	—	—	—
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	12	9	13
Sleeping Sickness	—	—	—
Sloughing Phagedæna	21	12	27
Small-pox	55	8	56
Syphilis	—	—	—
(*a*) Primary	300	—	308
(*b*) Secondary	770	20	822
(*c*) Tertiary	—	—	—
(*d*) Congenital	—	—	—
Tetanus	2	2	2
Trypanosoma Fever	—	—	—
Tubercle—	—	—	—
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—

GENERAL DISEASES—*continued.*	Admissions	Deaths	Total Cases Treated*
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	229	99	243
Varicella	—	—	—
Whooping Cough	—	—	—
Yaws	1	—	1
Yellow Fever	—	—	—
LOCAL DISEASES.			
Diseases of the—			
Cellular Tissue	336	12	360
Circulatory System—	—	—	—
(*a*) Valvular Disease of Heart	58	18	62
(*b*) Other Diseases	43	32	56
Digestive System—	—	—	—
(*a*) Diarrhœa	299	15	315
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	—	—	—
Congestion of Liver	6	—	6
(*d*) Abscess of Liver	10	6	10
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	4	1	4
(*g*) Cirrhosis of Liver	—	—	—
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	740	94	777
Ear	14	—	14
Eye	445	—	498
Generative System—	—	—	—
Male Organs	222	4	233
Female Organs	225	3	234
Lymphatic System	177	1	187
Mental Diseases	307	77	638
Nervous System	187	43	218
Nose	1	—	1
Organs of Locomotion	170	11	185
Respiratory System	666	223	699
Skin—	—	—	—
(*a*) Scabies	—	—	—
(*b*) Ringworm	—	—	—
(*c*) Tinea imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	55	—	57
(*f*) Other Diseases	1,205	3	1,263
Urinary System	180	69	190
Injuries, General, Local—	1,338	42	1,381
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	—	—	—
Parasites—	138	—	143
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	78	15	82
Filaria medinensis (Guinea-worm)	—	—	—
Tapeworm	—	—	—
Poisons—	—	—	—
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	1	—	1
Vegetable Alkaloids	3	2	3
Nature Unknown	—	—	—
Other Poisons	23	2	23
Surgical Operations—	757	—	757
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

* These include the cases remaining in hospital at the close of the previous year.

(204 of whom were females), including European police and maternity patients.

The principal causes of admission were: Malaria 201, venereal diseases 55, injuries 44, dysentery 30, enteric fever 23, alcoholism 13, tuberculosis, appendicitis, dengue and myalgia, each 11, malignant tumours, 8.

Others of interest were diphtheria 3, pneumonia 4, and beri-beri 1.

The deaths in the European wards were 33 in number (9 being females), as against 42 in 1908, the percentage of deaths to total treated being 4.16, against 6.16 in 1908.

The principal causes of death were enteric fever 5, dysentery 3, malignant tumours 3, intestinal obstruction 2, and tuberculosis 2.

Native Wards.

There were 2,676 (350 of whom were females) admissions to the native wards, including 101 admissions to the native maternity wards.

Deaths.

The number of native deaths was 256 (of whom 27 were among females and 3 among native maternity patients), against 332 in 1908, giving a percentage of total treated of 9.2, against 11.01 in 1908.

The chief causes of death were: Malaria 40, tuberculosis 39, dysentery 30, injuries 30, beri-beri 21, pneumonia 20, enteric fever 17.

Native Police.

There were 529 admitted as against 667 in 1908.

The chief causes of admission were: Malaria 193, venereal diseases 62, bronchitis 34, injuries 33, dysentery 16, boils 11, tuberculosis 10, conjunctivitis 9, asthma 7.

Maternity Wards.

The total admissions were 173, against 143 in 1908, and they consisted of 72 admissions to the European wards and 101 to the native wards.

Police Force.

(Report by Dr. Dane, Police Surgeon.)

The total number of the force attending the out-patient room at the Central Station was 3,924, against 4,454 in 1908; 3,518 in 1907; 3,301 in 1906 and 4,283 in 1905.

Of these out-patients 388 were sent to the General Hospital as in-patients, compared with 512 in 1908, 289 in 1907, 294 in 1906.

In addition to these 388 patients, 180 were sent direct to the General Hospital by their own officers.

Of the 568 thus admitted to the General Hospital the most common diseases were malaria 201, venereal 70, bronchitis 34, and dysentery 16. No deaths occurred.

Prison Hospital.

(Report by Dr. Dane, Acting Senior Medical Officer-in-charge.)

The sanitary condition of the prison is good, and the health of the prison satisfactory.

Admissions to hospital.—There were 1,181 admissions. This, with 45 who remained from the previous year, gives a total treated of 1,226. The average daily sick was 49.11, against 39.96 in 1908.

The diseases which showed most admissions were: Diarrhœa 212, fever (including malaria but excluding enteric) 180, dyspepsia 84, dysentery 66.

Cholera.—One case arrived in the gaol with the disease. He recovered and no other cases occurred.

Beri-beri.—Three prisoners arrived in prison with the disease. They were treated in the hospital. They all recovered and no other cases occurred. This makes three successive years during which no case has arisen in the gaol.

Tan Tock Seng's Hospital.

(Annual report, 1909, by Dr. Gray, Resident Medical Officer).

During the year 1909, 8,403 patients were admitted to the hospital, 455 remained at the end of 1908; the total treated in the wards being therefore 8,858. In addition to these many minor accident cases were treated without admission, or, in the case of women, treated and sent to the Female Pauper Hospital at Kandang Kerbau. Of the total number treated in the wards 6,672 were discharged, 100 absconded, 1,383 died and 446 remained in hospital at the end of the year.

The average daily number of patients in the ward was 470.06. The percentage of deaths to total treated was 15.61. The average daily stay of those discharged, died and remaining at the end of 1909, was, respectively, 16.93, 13.47, 70.59 days. The number of admissions was 1,719 more than that for 1908, and 874 more than that for 1907.

Out of 8,403 admissions, 1,030 were opium eaters, 670 opium smokers, 13 morphia eaters and 6 morphia injectors.

Of the 6,672 who were discharged, 3,967 are recorded as cured, 2,638 as relieved, and 67 not improved.

Leper Asylum.—Ten males and 20 females remained at the end of 1908. Forty-eight males and 7 females admitted during the year 1909. Twenty-seven males were transferred to the Leper Asylum at Pulau Jerejak. Three males absconded and 9 males and 3 females died during the year.

Quarantine Camp.—Six patients remained at the beginning of the year and 126 were admitted. 32 died, 3 absconded and 1 remained at the end of the year. The European portion was completely renovated and the native small-pox hospital ward was refloored and several window-frames were replaced.

Colonial Medical Reports.—No. 6.—Straits Settlements—(*continued*).

Lunatic Asylum.

(Report by Dr. H. J. Gibbs, Medical Superintendent.)

The average number of patients resident during the year was 344 (males 281, females 63), an increase of 18 as compared with that of the previous year.

The maximum and minimum daily numbers in the asylum were, respectively, 362 and 320.

There were under treatment on 31st December, 1908, 13 criminal lunatics and 9 lunatic criminals, 4 criminal lunatics and 3 lunatic criminals were admitted in 1909 making a total of 29 criminals treated during the year. Of these 6 have been discharged recovered, 2 have died, the sentence of 1 has expired and 20 remained under treatment.

Evidence of past and present venereal disease, mainly past, in the admissions was, as in the previous years, common. Over 20 per cent. of those admitted were so affected.

There were 14 cases of alcoholic insanity admitted. 10 of them were of a similar description to the cases described in last year's annual report.

Cholera.—An elderly Chinese patient named Gee Wan absconded on January 7th and was brought back on the night of the 9th by one of our Chinese attendants who saw him in the streets. He developed cholera at 3 a.m. of the 14th and died the next morning. On his return to the asylum he was segregated, as are all new Chinese admissions. No other cases occurred.

Four determined attempts at suicide were frustrated by the vigilance of the attendants.

Ninety-three patients were discharged recovered, giving a recovery rate of 42.27 per cent. on the admissions, which is a decided improvement on the 1908 rate and, though comparing favourably with the rates for most of the other years, falls short of 1902 by 14.33 per cent.

Sixty-five males and 13 females died in 1909, giving a percentage of 22.67 on the average daily number resident and of 14.03 on the total treated.

Singapore.

Return of the Statistics of Population for the Year 1909.

	Europeans	Eurasians	Malays	Chinese	Tamils	Other Nationalities	Total
Number of inhabitants in 1909	4,364	4,611	36,154	209,356	19,446	3,727	277,658
,, Births during the year 1909	121	153	1,576	3,880	374	92	6,196
,, Deaths ,, 1909	48	125	1,532	8,126	836	112	10,779
,, Immigrants ,, 1909	Not available						
,, Emigrants ,, 1909							
Number of inhabitants in 1908	4,295	4,548	36,145	203,251	19,212	3,579	271,060
Increase	69	63	9	6,105	204	148	6,598
or							
Decrease	—	—	—	—	—	—	—

Meteorological Return for the Year 1909.

	Temperature						Rainfall		Winds		Remarks
	Solar maximum	Minimum on grass	Shade maximum	Shade minimum	Range	Mean	Amount in inches	Degree of humidity	General direction	Average force	
	F.	F.	F.	F.	F.	F.	Inches	Per cent.			
January	150.1	66.1	86.9	72.6	14.3	81.2	14.66	76.6	N.E.	Not recorded	
February	147.8	69.9	86.2	72.5	13.7	80.4	9.41	77.2	N.E.		
March	157.9	70.4	88.3	72.3	16.0	82.3	18.37	78.6	N.E.		
April	148.9	71.2	87.4	75.2	12.2	82.7	11.50	78 2	E.		
May	153.2	72.5	89.5	75.7	13.8	84.6	4.68	78.9	S.W.		
June	147.3	71.6	87.7	74.9	12.8	82 7	10.54	77.9	S.E.		
July	151.3	71.2	88.6	75.3	13.3	84.2	1.03	78 2	S.W.		
August	151.4	71.1	87.0	74.1	12.9	82.2	7.27	77.3	S.W.		
September	151.0	71.5	88.2	74.3	13.9	83.1	5.90	77.7	S.W.		
October	151.8	71.9	88.0	75.1	12.9	83.2	5.29	78.4	S.W.		
November	148.3	70.6	87.3	73.3	14.0	81.9	9.65	77.5	N.W.		
December	146.8	69.8	85.8	73.3	12.5	80.2	10.99	76.5	N.E.		
Mean	150.5	70.6	87.5	74.5	13.0	82.4	Total 109.79	77.8	—	—	

Beri-beri Hospital.

(Report by Dr. W. Gilmore Ellis, Physician-in-charge.)

On December 31, 1908, there remained 112 patients, 271 were admitted during the year, making the total treated 383 as compared with 453 for the previous year.

Of these, 181 were discharged recovered, 69 were discharged improved, 4 were discharged not improved, 3 absconded, 7 died, and 119 remained under treatment at the end of the year.

Of those dying but one died from beri-beri. The causes of death in the remaining 6 being chronic diarrhœa 2, pulmonary tuberculosis 1, heart disease 1, fracture of skull from accidental fall 1, suicide by creasol poisoning 1.

It may be interesting to record that the knee-

jerks had returned in 28 and were absent in 97 of the last 125 patients discharged recovered.

There are 11 patients with over 12 months' residence, the oldest patient having been admitted on April 14th, 1907. In these very chronic cases, all of whom were admitted with complete paraplegia, atrophy of the legs, ankle drop and in many instances wrist drop, a considerable period of time has to elapse before recovery. Of these 11 cases 7 are now able to walk a little without assistance, the remaining 4 with the aid of a stick. In 9 the knee-jerks are still absent, in the other 2 some slight response can be elicited and these 2 are steadily recovering. I have already chronicled a case in which a patient who had been paralyzed for nearly three years was beginning to walk once more when he developed acute dysentery and died. *Post mortem* new nerve fibres were seen running through the sheaths of old degenerated peroneal nerves.

There were no relapses and but one death from beri-beri in 383 treated. The abolition of uncured rice as food and the good hygienic surroundings prevailing must be credited with this success.

Penang.

(Report by Dr. F. B. Croucher, Senior Medical Officer.)

The births in the Settlement during 1909 show a decrease of 700 as compared with 1908, being 6,755, 3,416 males and 3,339 females. Of this number 2,706, 1,356 males and 1,350 females were registered in Penang Island alone. With an estimated population of 260,488, this shows a birth-rate of 25.93 per mille, compared with 28.78 per mille in 1908 and 24.10 per mille in 1907.

The number of deaths recorded was 9,059, 6,102 males and 2,957 females as compared with 9,616 deaths in 1908 and 8,136 in 1907. The death-rate for the year on the estimated population given above was 34.78 per mille, compared with 37.12 for the previous year. The death-rate for Penang Island alone was 37.44 per mille, against 43.12 in 1908 and 36.13 in 1907.

PUBLIC HEALTH.

The general health of the Settlement judging by the statistics given above, although it shows an improvement on previous years, cannot be regarded as quite satisfactory. The decrease in the number of deaths is to some extent discounted by the large decrease in the number of births recorded, infant mortality among natives being so high. The average death-rate for the five years previous to 1909 was 35.59.

The deaths from beri-beri as compared with 1908 show a decrease of 135. In Government institutions where parboiled rice is exclusively used no case has occurred among the inmates during the year. In the Municipal area the deaths from beri-beri show a decrease from 488 in 1908 to 357 in 1909.

Malarial fever shows a decrease from 820 deaths in 1908 to 712 in 1909. In Municipal limits alone there is a decrease in the number of deaths due to this disease from 746 in 1908 to 654 in 1909.

INFANTILE MORTALITY.

One thousand and forty-three deaths occurred in children under five years of age, of which 475 were of infants 3 months old or under. Tetanus and convulsions accounted for 359 of those deaths (138 being within Municipal limits in 1909 and 193 in 1908), against 417 deaths from these diseases in 1908.

GENERAL DISEASES.

The admissions to the various hospitals in Penang and the Dindings were 6,870, against 7,179 in 1908. The admissions show a decrease for malaria of 80, beri-beri of 101, diarrhœa of 34 and venereal diseases of 54, whilst an increase is shown of cases for dysentery of 33 and for phthisis of 51.

The Out-door Dispensaries at Penang, Balik Pulau and Lumut show a total of 9,038 persons treated, against 7,957 in 1908.

QUARANTINE CAMP.

(Report by Dr. A. H. Keun, Medical Officer.)

There were no patients in the camp at the beginning of the year. During the year the following diseases were treated:—

Chicken-pox 29, measles 8, small-pox 3 (with 2 deaths), cholera 1 (which proved fatal), and bubo 1, making a total of 42 treated with 7.14 per cent. deaths to total treated; and 1.16 average daily sick.

Twenty-four out of 42 sought admission to the camp by themselves or were brought in by relatives and friends, the remaining 18 cases were sent in by the Municipal Health Officer and Deputy Health Officer of the port.

The Quarantine Camp was occupied for 233 days during the year.

Forty-two admissions took place during the year as compared with 61 for 1908. There were 3 deaths, 2 from small-pox and 1 from cholera. One of the small-pox deaths occurred in a European lady who was landed here from Rangoon on March 1st and died on March 7th, she bore no marks of vaccination and the disease was of a most malignant and hæmorrhagic type, the other death from small-pox was in a Chinaman sent from No. 99, Malay Street, by the Municipal Health Officer and who died within 11 hours of admission, the third death was in a Eurasian Government clerk suffering from cholera which he contracted on his way from Singapore to India on leave.

GENERAL HOSPITAL.

(Report by Dr. F. B. Croucher, Senior Medical Officer.)

There were 192 patients admitted to the European wards and 1,170 to the native wards as compared with 205 and 1,312, respectively, during the previous year. The mortality, excluding deaths within twenty-four hours of admission, was 4·25 for

RETURN OF DISEASES AND DEATHS IN 1909 AT THE FOLLOWING INSTITUTIONS:—

General, District, Lock, Criminal Prison, Quarantine Camp, Jelutong; European Small-pox, Balik Pulau, Leper Hospital, Pulau Jerejax; Pumut Hospitals and Female Leper Ward, Jelutong, Penang, Straits Settlements.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated*
Alcoholism	55	2	61
Anæmia	350	77	385
Anthrax	—	—	—
Beri-beri	193	33	242
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	34	—	34
Cholera	1	1	1
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	—	—	—
Delirium Tremens	—	—	—
Dengue	2	—	2
Diabetes Mellitus	4	1	4
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	387	149	402
Enteric Fever	7	2	8
Erysipelas	3	2	3
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	126	—	134
Gout	1	—	1
Hydrophobia	—	—	—
Influenza	—	—	—
Kala-Azar	—	—	—
Leprosy	246	139	631
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	—	—	—
(*c*) Mixed	—	—	—
Malarial Fever—	—	—	—
(*a*) Intermittent	405	16	414
Quotidian	—	—	—
Tertian	—	—	—
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	148	8	151
(*b*) Remittent	—	—	—
(*c*) Pernicious	194	34	203
(*d*) Malarial Cachexia	75	2	79
Malta Fever	8	—	8
Measles	—	—	—
Mumps	3	—	3
New Growths—	—	—	—
Non-malignant	37	3	37
Malignant	9	3	9
Old Age	—	—	—
Other Diseases	222	20	229
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	2	—	2
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	228	8	253
Rheumatoid Arthritis	5	—	6
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	1	—	1
Sleeping Sickness	—	—	—
Sloughing Phagedæna	19	6	22
Small-pox	3	2	3
Syphilis	—	—	—
(*a*) Primary	63	—	63
(*b*) Secondary	372	16	428
(*c*) Tertiary	66	4	66
(*d*) Congenital	—	—	—
Tetanus	10	5	10
Trypanosoma Fever	—	—	—
Tubercle—	—	—	—
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—
GENERAL DISEASES—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	22	6	24
Varicella	—	—	—
Whooping Cough	—	—	—
Yaws	—	—	—
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated*
Diseases of the—			
Cellular Tissue	203	15	233
Circulatory System—	—	—	—
(*a*) Valvular Disease of Heart	15	6	15
(*b*) Other Diseases	17	10	19
Digestive System—	—	—	—
(*a*) Diarrhœa	207	44	235
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	12	3	12
Congestion of the Liver	—	—	—
(*d*) Abscess of Liver	—	—	—
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	13	10	13
(*g*) Cirrhosis of Liver	59	28	65
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	1	1	4
(*j*) Other Diseases	323	20	333
Ear	10	1	10
Eye	113	1	120
Generative System—	—	—	—
Male Organs	160	1	170
Female Organs	29	—	31
Lymphatic System	92	—	103
Mental Diseases	—	—	—
Nervous System	140	39	162
Nose	1	1	1
Organs of Locomotion	100	6	107
Respiratory System	414	168	444
Skin—	—	—	—
(*a*) Scabies	—	—	—
(*b*) Ringworm	—	—	—
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	29	—	30
(*f*) Other Diseases	705	16	777
Urinary System	41	11	43
Injuries, General, Local—	400	31	413
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	—	—	—
Parasites—	362	2	380
Ascaris lumbricoides	3	1	9
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	77	19	80
Filaria medinensis (Guinea-worm)	2	—	2
Tape-worm	—	—	—
Poisons—	—	—	—
Snake-bites	3	1	3
Corrosive Acids	2	2	2
Metallic Poisons	—	—	—
Vegetable Alkaloids	4	2	4
Nature Unknown	—	—	—
Other Poisons	4	—	4
Surgical Operations—	196	—	196
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

* These include the cases remaining in hospital at the close of the previous year.

Europeans, &c., 5.81 for natives, that for 1908 being 6.05 for Europeans, &c., and 6.60 for native patients.

The principal diseases treated were: Malaria 165, dysentery 42, beri-beri 15, venereal 86, diarrhœa 23, phthisis 26.

Beri-beri.—Fifteen cases were under treatment as against 39 in 1908. All the patients in hospital were fed on parboiled rice throughout the year. No cases of beri-beri occurred amongst patients admitted for other diseases.

Operations.—One hundred and sixty-three operations were performed during the year as against 98 in 1908.

Prison Hospital.

(Report by Dr. A. H. Keun, Medical Officer.)

Four thousand and fifty-one prisoners were admitted during the year, the daily average prison population being 278.39.

Three hundred and forty-nine prisoners were admitted into hospital (exclusive of those detained for 48 hours for trivial complaints); of these 52 were vagrants. The hospital sick-rate was 16.30, and the prison rate 5.85.

The average daily sick were non-vagrants 12.71 and vagrants 3.59.

There were two admissions for beri-beri during the year, both were admitted into prison with the disease already developed in them. All the inmates were fed on parboiled rice.

The following were the chief diseases treated with deaths from each:—

Diseases	Treated	Deaths	Percentage
Dysentery	45	5	11.11
Diarrhœa	71	2	2.81
Abscess	36	—	—
Ulcer	39	—	—
Venereal Diseases...	14	—	—

of the 71 treated for diarrhœa 38 acquired the disease in the prison, and in 33 the disease was brought in from outside. Of the 45 cases of dysentery 22 occurred among the prison inmates, and 23 among prisoners admitted with the disease who were admitted at once into hospital.

Five hundred and seventy-seven prisoners were vaccinated during the year, the percentage of successful cases was 93.91, as against 714 prisoners last year with a percentage of 96.9 successful cases.

District Hospital.

(Report by Dr. A. H. Keun, Medical Officer.)

Work Done.—On January 1st, 1909, there were 409 cases under treatment. During the year 4,187 were admitted: males 3,933, including 52 in the European ward; females 254, making a total treated of 4,587.

The average daily number of sick was males 343.14, females 17.13. There were 646 deaths, males 594, including one Eurasian and 52 females. The percentage to deaths to total treated being thus 14.08 as compared with 15.25 for the previous year, 15.36 in 1907 and 17.49 in 1906, of these 8 died within 24 hours.

Phthisis.—There was again this year a steady increase of admissions, 261 cases were treated with 129 deaths, giving a percentage of 49.42, last year 215 with 116 deaths, the percentage being 53.95.

Venereal Diseases accounted for 582 admissions.

Malarial Fevers have been slightly less this year than last; thus there were 460 treated with 39 deaths (mortality 8.47). In 1908—495 with 52 deaths (mortality 10.54). In 1907—298 with 31 deaths (mortality 10.47), and in 1906 366 cases, 37 deaths (mortality 10.10). In every case the diagnosis was made on the results of a blood examination, and every patient complaining of fever in the course of treatment for other disease had his blood examined.

Beri-beri accounted for 153 admissions with 26 deaths (mortality 16.99), as contrasted with 260 admissions and 45 deaths (mortality 17.30) in 1908; no cases occurred amongst inmates in the other wards of the hospital, only 5 Tamils were admitted for this disease, the rest being Chinese. Parboiled rice was continued in use.

Dysentery.—295 cases were treated with 122 deaths (mortality 41.35). This high mortality is accounted for by the fact that cases for the most part are brought in when treatment by outside doctors, &c., have proved of no avail and when patients were in a practically moribund condition or when complications such as œdema, marasmus, &c., have already set in.

Diarrhœa, Acute and Chronic, accounted for 115 cases with 35 deaths (mortality 30.43), and in 1908 239 cases with 86 deaths (mortality 35.98).

Eye Ward, District Hospital, Penang.

(Report by Dr. J. Kirk, Honorary Visiting Ophthalmic Surgeon.)

I was in charge of this department during the year. The new building was taken over early in January, and has proved very suitable for its purpose. There has been a great improvement in the comfort of the patients and in the results of treatment. Post-operation sepsis and patient-to-patient infection which were very common in the old ward have quite disappeared.

The class for whom the department is intended are taking every month more advantage of it and the ward is generally full. Every effort should be made to bring to the notice of the lower classes of the native community, among whom preventible eye disease is rife, the opportunities they have for free European treatment.

Trachoma as in previous years furnishes a very large proportion of the cases treated. The ravages of this disease among the poorer classes are not yet realized. It is responsible directly and indirectly for 80 per cent. of eye trouble and blindness and the durability, general misery, and physical incapacity which follows.

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There were 120 cases admitted during the year as in-patients and 18 attended as out-patients. Twenty-eight operations were performed.

Balik Pulau Hospital.

(Report by Dr. F. B. Croucher, Senior Medical Officer.)

Work Done.—During the year 319 patients were admitted. This with 27 remaining from the previous years brings the total treated to 346, or 117 more than the previous year. The daily average sick was 38.98, 8.80 more than the year before.

The principal diseases with deaths if any, in brackets, were as follows:—Malarial fever 78 (7), syphilis 40 (1), anæmia 20 (3), beri-beri 18 (3), rheumatism 19 (1), dysentery 9 (5), phthisis 5 (5), ulcers 63 (4). Most of the ulcers were of a chronic nature and primarily due to traumatism in debilitated subjects.

Health.—Good. No epidemic outbreak.

Lumut Hospital, Dindings.

(Report by Dr. F. B. Croucher, Senior Medical Officer.)

Work Done.—Two hundred and eighty-nine cases were admitted during the year. This, with the 7 remaining from the previous year, makes a total of 296 cases treated, being 74 cases less than the previous year. The principal diseases treated were in order of frequency: General diseases 146, of which 114 were of malarial fever in its various forms. Diseases of the skin 69, injuries 37, diseases of the digestive system 22, diseases of the nervous system 5, respiratory system 3, animal poison 3, diseases of the eye 2, ear 2, general injuries 2, lymphatic system 1, urinary system 1, generative system 1, affection consequent on parturition 1, and diseases of the connective tissue 1. The average daily sick was 10.6.

Mortality.—Twenty-four deaths occurred during the year. Of these 5 died within 24 hours of admission. The causes of death in the fatal cases were: Diarrhœa 7, anæmia 4, beri-beri 2, dysentery 2, phthisis 2, erysipelas 1, malaria 1, chronic malaria 1, multiple neuritis 1, paralysis 1, infantile convulsion 1, and starvation 1.

Health.—The health of the Settlement has been satisfactory. No case of infectious disease was reported. The health of the Malay Police was good. There were 12 police admissions to the hospital. No death occurred. The general health of the population in Lumut was good.

Leper Asylum, Pulua Jerejak.

(Report by Dr. J. C. C. Ford, Medical Officer-in-charge.)

Those of the lepers who are sufficiently able-bodied are detailed off as ward attendants, toties and garden labourers, and are remunerateed with a small monthly wage.

The average daily number of inmates was 396.35. The percentage of deaths was 23.22. The number of leper inmates during 1909 is the largest ever recorded.

The longest term of residence in the asylum is 19 years and five months, and the disease in this leper, who is Chinese, seems to be arrested. He suffers from the anæsthetic variety, and has been in the same condition for years. The youngest lepers are aged 12 and 13 years respectively.

On two occasions have father and son been admitted. On the first occasion both father and son were admitted together; on the next the son came first, and the father followed a month afterwards. They were Tamils.

Three lepers have one eye destroyed, and nine others are totally blind.

Penang and Dindings.

Statistics of Population for the Year 1909.

	Total	
	Penang	Dindings
Number of inhabitants in 1909	133,697	4,575
,, Births during the year 1909 ...	2,706	169
,, Deaths ,, 1909 ...	5,006	232
Number of inhabitants in 1908	133,067	—
Increase	887	59
Decrease	257	—

Meteorological Return for the Year 1909.

—	Temperature					Rainfall		Winds	
	Solar Maximum	Minimum on grass	Shade Maximum	Shade Minimum	Range	Mean	Amount in inches	Degree of humidity	General direction	Average force
	F.	F.	F.	F.	F.	F.	Ins.	Per cent.		
January ...	143.4	72.2	88.7	74.8	13.9	81.4	3.39	80.0	N.W.	280
February ...	148.0	71.3	88.8	74.8	14.0	81.6	5.19	78.0	N.W.	300
March ...	155.9	71.5	91.9	75.4	16.5	85.5	3.32	74.0	N.W.	270
April	149.7	71.2	90.0	75.3	14.7	82.2	2.32	82.0	N.W.	268
May	147.0	70.7	91.3	75.3	16.0	82.5	3.11	84.0	N.E.	270
June	142.3	70.1	90.1	74.7	15.4	80.6	14.76	86.0	N.W.	255
July	142.0	70.0	90.0	74.7	15.3	81.1	6.86	84.0	S.	281
August ...	147.0	70.2	89.3	74.8	14.5	80.6	14.76	86.0	S.E.	272
September ...	144.6	70.6	89.1	74.9	14.2	81.7	26.57	92.0	S.	255
October ...	145.9	70.2	88.9	71.3	17.6	81.5	32.11	83.0	N.W.	288
November ...	141.9	—	88.7	70.6	18.1	80.8	15.68	84.0	N.W.	273
December ...	140.5	—	89.1	70.1	19.0	81.2	2.38	79.0	N.W.	255
Mean ...	145.6	59.0	89.6	73.8	15.7	81.7	10.86	82.66		

RETURN OF DISEASES AND DEATHS IN 1909 AT THE FOLLOWING INSTITUTIONS:—

Butterworth, Bukit Mertajam and Sungai Bakap Hospitals, Province Wellesley, Straits Settlements.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated*
Alcoholism	13	—	13
Anæmia	46	17	50
Anthrax	—	—	—
Beri-beri	59	9	79
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	11	—	11
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	—	—	—
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	253	86	261
Enteric Fever	3	3	3
Erysipelas	3	2	3
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	67	—	73
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	—	—	—
Kala-Azar	—	—	—
Leprosy	5	1	5
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	—	—	—
(*c*) Mixed	—	—	—
Malarial Fever—	—	—	—
(*a*) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	152	1	152
Quartan	11	—	11
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	—	—	—
(*c*) Pernicious	183	21	186
(*d*) Malarial Cachexia	46	5	46
Malta Fever	—	—	—
Measles	10	—	10
Mumps	1	—	1
New Growths—	—	—	—
Non-malignant	10	—	10
Malignant	12	4	13
Old Age	—	—	—
Other Diseases	—	—	—
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	24	—	26
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	1	—	1
Septicæmia	—	—	—
Sleeping Sickness	—	—	—
Sloughing Phagedæna	7	3	8
Small-pox	3	—	3
Syphilis	—	—	—
(*a*) Primary	6	—	6
(*b*) Secondary	158	4	168
(*c*) Tertiary	20	—	20
(*d*) Congenital	—	—	—
Tetanus	—	—	—
Trypanosoma Fever	—	—	—
Tubercle—	—	—	—
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—
GENERAL DISEASES—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	6	2	6
Varicella	—	—	—
Whooping Cough	—	—	—
Yaws	1	—	1
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated*
Diseases of the—			
Cellular Tissue	64	1	71
Circulatory System—	—	—	—
(*a*) Valvular Disease of Heart	42	13	44
(*b*) Other Diseases	6	3	6
Digestive System—	—	—	—
(*a*) Diarrhœa	120	47	126
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	1	—	1
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	—	—	—
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	3	—	3
(*g*) Cirrhosis of Liver	18	12	21
(*h*) Acute Yellow Atrophy	1	1	1
(*i*) Sprue	3	—	3
(*j*) Other Diseases	55	4	55
Ear	—	—	—
Eye	37	—	40
Generative System—	—	—	—
Male Organs	113	—	116
Female Organs	12	1	12
Lymphatic System	30	—	38
Mental Diseases	—	—	—
Nervous System	31	6	37
Nose	—	—	—
Organs of Locomotion	59	—	60
Respiratory System	162	53	173
Skin—	—	—	—
(*a*) Scabies	—	—	—
(*b*) Ringworm	—	—	—
(*c*) Tinea imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	24	—	25
(*f*) Other Diseases	339	—	358
Urinary System	40	9	42
Injuries, General, Local—	157	5	173
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	—	—	—
Parasites—	30	—	30
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	97	19	101
Filaria medinensis (Guinea-worm)	—	—	—
Tapeworm	—	—	—
Poisons—	—	—	—
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	1	—	1
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	121	—	—
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

* These include the cases remaining in hospital at the close of the previous year.

Female Leper Ward, Jelutong.

(Report by Dr. A. H. Keun, Medical Officer-in-charge.)

There were fifteen cases remaining at the end of 1908: Eurasian 1, Chinese 12, and Hindu 2.

Six cases were admitted during the year. Chinese 5, Hindu 1, making a total of 21 treated.

There were three deaths during the year, 2 Chinese and 1 Hindu from cardiac failure. The percentage of deaths to total treated was 14.28, and the average daily sick was 16.87.

Province Wellesley.

(Report by Dr. W. S. Sheppard, Medical Officer.)

The health of this district was fairly good in 1909. No serious epidemic occurred.

The registered births numbered 3,880 and the deaths 3,823, as compared with 4,328 and 3,627, respectively, in 1908.

The estimated population was 122,216.

Two thousand six hundred and ninety-six patients were admitted to the three Government hospitals. There were 342 deaths. The corresponding figures for 1908 were 2,867 and 332.

Twenty-one cases of small-pox occurred at Paya Kladi in the north of the Province in the months of April, May and June. Temporary isolation sheds were erected locally and 391 people were vaccinated. The infection probably came from Kedah.

Eleven cases of measles occurred in November and December in the southern parts of the districts.

The water supply in the south of the Province has been improved.

Statistics of Population for the Year 1909.

Number of inhabitants in 1909	122,216
Number of births during the year 1909	3,880
Number of deaths during the year 1909	3,823
Number of inhabitants in 1908	121,410
Increase	564

Bukit Mertajam Hospital.

Fifty-six cases of beri-beri were admitted, with only 6 deaths, 4 of these occurring within 24 hours of admission.

Two hundred and thirty-six cases of malarial fever were admitted. Mosquito nets have been introduced into the hospital for the first time this year. The increase in the number of malarial diseases is not easy to account for. I think that it is mostly due to the greater use of the hospital by the people and the improved diagnostic skill of the assistant surgeon in charge. Attempts will be made to popularize the use of quinine in this part of the Province.

A considerable number of minor operations (opening of abscesses, skin-grafting, circumcision, &c.) were performed during the year.

Estate Hospitals.

The health of the coolies on the estate in the South of the Province and on Prai estate has not been good. There has been a large increase in the number of cases of dysentery. If this one disease could be eliminated from the list, there would be no healthier class than the Tamil coolies.

Unfortunately all our efforts in this direction seem to meet with little success. The water supply and the food supply both received careful attention from the managers, but in spite of this bowel disorders attack the coolie.

The fact that the adult male Tamil is frequently the only sufferer on estates, when Javanese and Chinese also share a common food and water supply and yet escape intestinal disorders, leads me to suspect the toddy shop to be the source of infection in many cases.

The toddy sold to the coolies is, no doubt, often greatly adulterated. On some estates the sale of toddy is in the hands of one of the tindals, and complaints of this practice have reached me from the coolies.

Seven samples of toddy which I collected from the estates and submitted to the Assistant Government Analyst showed acetous acid fermentation, and contained a considerable quantity of acetic acid. Some authorities state that toddy is not fit for consumption more than 24 hours after collection on account of the acidity which is produced after this period.

Meteorological Return for the Year 1909.

	Temperature					Rainfall		Winds	
	Solar maximum	Minimum on grass	Shade maximum	Shade minimum	Range	Mean	Amount in inches	Degree of humidity	General direction	Av. force
	F.	F.	F.	F.	F.	F.	in.	per cent.		
January	152.1	70.4	91.5	72.5	19.0	82.9	17.81	72.0	W.	4
February	153.6	69.7	90.9	71.7	19.2	82.4	16.18	73.0	N.W.	4
March	159.2	71.6	93.1	73.5	19.6	85.3	15.29	69.0	N.W.	4
April	156.0	70.8	92.0	72.7	19.3	84.3	12.32	73.0	N.W.	4
May	147.7	71.1	91.6	72.7	18.9	84.1	20.79	72.0	N.W.	4
June	145.5	70.6	90.7	72.3	18.4	83.5	13.27	73.0	N.W.	4
July	150.5	71.1	91.5	72.9	18.6	84.1	7.91	71.0	N.W.	4
August	147.5	70.6	90.2	71.6	18.6	82.5	27.53	74.0	S.W.	4
September	148.2	70.9	90.7	72.6	18.1	83.8	23.11	73.0	N.W.	4
October	144.3	70.5	90.1	72.0	18.1	82.8	32.08	77.0	S.W.	4
November	145.8	70.9	89.3	72.3	17.0	82.3	24.19	74.0	N.W.	4
December	150.9	69.8	89.9	71.4	18.5	81.8	10.24	75.0	N.W.	4
Mean	150.1	70.6	90.9	72.3	18.6	83.3	Total 220.72	73.0		

The managers are themselves suspicious of the quality of some of the toddy sold on their estates, and I hope to see some good results follow our effort after reform in this direction.

During the year I submitted samples of water from Batu Kawan Estate to the Government Analyst. Analysis showed slight impurity, probably of vegetable origin. A filter has been erected, and there has been considerable improvement in the quality of the water. I expect to see a lower death-rate on this estate next year. The manager has also taken steps to prevent the introduction of unwholesome toddy to the estate.

The average death-rate amongst the coolies on the above-mentioned estates was 4.42 per cent. as against 4.91 in 1908.

A small hospital was built on Bertam Estate during the year.

Malacca.

(Report by Dr. E. G. Weir, Acting Medical Officer.)

The general health of the Settlement during 1909, judging by the number of deaths recorded, is far from satisfactory, although there is some improvement shown on the previous year, the death-rate being 41.46 per mille, against 47.88 per mille for 1908.

The estimated mean population for the year was 98,526, comprised as follows:—

Europeans	55
Eurasians	1,496
Malays	20,617
Chinese	75,241
Indians	1,039
Others	78

The births numbered 4,043 (2,059 males and 1,984 females), against 4,535 in 1908 and 4,202 in 1907, giving a birth-rate of 41.03 per mille, against 46.21 in 1908 and 42.98 in 1907.

The deaths numbered 4,085 (2,594 males and 1,491 females), giving a death-rate of 41.46 per mille, against 47,88 per mille for 1908 and 38.28 for 1907.

Of this number, 1,220 were of infants under one year of age showing a percentage of 29.86 of the total deaths, against 29.94 per cent. in 1908.

There was no serious illness of an infective nature reported during the year.

One case of chicken-pox occurred in the town.

Beri-beri.—524 cases were treated during the year with 52 deaths, giving a death-rate of 9.92 per cent., against 7.53 per cent. in 1908 and 9.55 per cent. in 1907.

Parboiled rice was used in the various Government institutions throughout the year. One case occurred at the police depôt in a Malay sub-inspector, with a fatal result. He had been warned against Siam rice, but refused to alter his diet.

Municipality.—The number of deaths within Municipal limits was 732 (461 males and 271 females).

The number of births was 623 (332 males and 291 females).

The infant mortality was 222 in children under one year of age, giving a percentage mortality of 35.63 to the total births.

Government hospitals.—3,115 cases were treated during the year, against 4,348 in 1908 and 3,880 in 1907.

There were 350 deaths, giving a percentage of 11.23, against 9.61 in 1908 and 8.99 in 1907.

Statistics of Population for the Year 1909.

Number of inhabitants in 1909	98,526
Number of births during the year 1909	4,043
Number of deaths during the year 1909	4,085
Number of inhabitants in 1908	98,138
Increase	388

Quarantine.

(Report by Dr. G. E. Brooke, Port Health Officer.)

Port.—During the year 1,251 visits were paid to vessels by the Department, and included the examination of 77,304 crew units, and of 214,321 passengers.

Of these ships 27 were infected.

Small-pox	17
Plague	3
Cholera	6
Double infection	1

Five of the above small-pox infections occurred on ships returning from Jeddah.

Meteorological Return for the Year 1909.

	Temperature						Rainfall		Winds	
	Solar maximum	Maximum on grass	Shade maximum	Shade minimum	Range	Mean	Amount in inches	Degree of humidity	General direction	Average force
	F.	F.	F.	F.	F.	F.	in.	per cent.		
January	152.0	64.0	86.0	76.0	10.0	80.0	4.95	94.0	N.E.	182.3
February	155.0	64.0	86.0	77.0	11.0	79.0	3.25	92.0	N.W.	188.2
March	153.0	65.0	87.0	75.0	12.0	82.0	4.08	93.0	N.W.	189.4
April	149.2	85.6	90.0	73.0	18.0	82.0	13.81	91.0	—	—
May	142.3	70.6	87.0	75.0	12.0	83.0	4.34	91.2	N.W.	193.6
June	140.0	70.3	89.0	73.0	16.0	81.0	6.14	95.0	W.	197.5
July	143.7	70.5	89.7	72.4	15.3	82.0	1.36	94.3	N.W.	195.3
August	146.0	69.5	89.2	72.1	17.1	81.9	16.15	95.6	S.W.	199.8
September	146.0	69.0	89.0	72.0	17.0	81.8	11.69	92.0	S.W.	202.6
October	146.0	67.0	89.0	72.0	17.0	81.0	5.57	93.0	S.W.	200.4
November	145.0	69.0	89.8	71.9	17.9	81.3	10.19	95.9	N.W.	190.8
December	144.6	67.3	89.9	71.9	18.0	81.1	5.96	95.9	N.E.	187.8
							Total			
Mean	146.9	69.3	88.4	73.4	15.1	81.3	87.49	93.5		193.4

Colonial Medical Reports.—No. 6.—Straits Settlements—(*continued*).

The disinfecting lighter " Hygeia " was used for disinfecting on 29 occasions, including one beri-beri ship and one clean ship clearing for Australia.

When Singapore is healthy the disinfection of ships sailing for Australia would seem to be superfluous, but is now required by the sanitary authorities, although no notice is taken of the passengers or their baggage.

The " Hygeia " also proved very useful in transport service, being used on 18 occasions for changing the monthly police guard at St. John's and for conveying heavy stores to the quarantine station.

One visit was paid to Pulau Bukom in October to inquire into a supposed case of infectious disease.

Ten visits were paid to the Marine Department lines at Pulau Brani either to visit the sick or to inquire into infectious disease, death or insanitary conditions. There has been a considerable improvement in the health of the men stationed there.

A suspicious case of cholera being reported from Horsburgh lighthouse, I proceeded there on January 27th, and found two cases of dysentery. The lighthouse was inspected and certain recommendations made for the improvement of the sanitary condition and diet.

On April 9th a Chinese junk was reported from Tanjong Katong as having been attacked by pirates during the previous night. This vessel I had brought to the Master Attendant's Pier and found five dead and four injured Chinese, all the dead having been mutilated. The injured were sent to the General Hospital for treatment, and the dead to Tan Tock Seng's Hospital for *post-mortem* and inquest.

The state of health of 5,876 incoming vessels (not in quarantine) was ascertained for me by the courtesy of the Marine Department, who presented certificates for signature by the surgeon or master of each vessel. In this way the Department is cognizant of the state of health of every ship arriving in Singapore.

These certificates quoted 282,851 crew and 289,084 passengers.

Cases of death on sampans or steamers in port occurred to the number of 45. All of these were investigated. Thirty-six permits to bury were issued, and the remaining 9 were sent to St. John's for *post-mortem* and burial.

Permission to export bodies for burial in China, or to import bodies for burial here, was given in 21 cases, the proper formalities as to disinfection and sealing of the coffin having, in each case, been complied with.

Office and Shore Work.—Bills of health to the number of 1,299 were issued by the Department.

One hundred and fifty sick amongst the Marine Department Staff were treated in the office.

As Deputy Health Officer for the Island of Singapore 6 cases of infectious disease, occurring in the country or in Government buildings of the town, were dealt with.

To accommodate the Municipality we remove their infectious disease contacts to St. John's for observation at our Quarantine Station. During the year the number so removed were: Cholera contacts, 279; small-pox, 174; plague, 33.

The Quarantine Station was in occupation during every day of the year.

The total passengers landed were 15,072. The maximum number on any day was 2,007.

The total sick treated in hospital were 775; the average daily number of sick being 22.72 and the maximum number on any day 60. When the hospitals are full the whole island is generally full.

The death-rate amongst the sick was 4.67 per cent.; and the total number of deaths 36.

The rainfall was 77.11 in.

The number of vaccinations done was 1,084.

Throughout the year the distilling plant worked well and was kept in excellent order by the engineer. By judicious management we were able to supply distilled water for drinking and cooking throughout the whole year without having to obtain any from Singapore.

PENANG.

(Report by Dr. J. C. C. Ford, Medical Officer.)

Harbour.—Five hundred and three vessels with 43,135 members of crew and 118,836 passengers were medically inspected. Under the Pilgrim Ships' Ordinance 7 vessels were inspected and cleared for Camaran and Jeddah; the number of the pilgrims embarking at this port was 4,027. Six vessels with Hadjis, returning from the Hedjas, arrived during January, February and March; four of these " return " vessels were infected with small-pox.

Seven deaths occurred on vessels and in tongkangs within harbour limits. Permits for landing and burial ashore were granted after view and investigation.

In accordance with section 18 of " The Quarantine Rules 1908 " 1,861 passengers were permitted to leave vessels, with written undertakings to submit to daily inspection. Sixteen vessels arrived with disease.

One European female saloon passenger was landed with confluent small-pox from a Rangoon vessel. She was treated in the Quarantine Camp, Jelutong, and succumbed to the disease in a week.

The s.s. " Persia " arrived from Bombay on 3rd June, 1909, with one of the European crew ill with bubonic plague (glands of neck); the patient expired on board soon after the arrival of the vessel.

Quarantine Station, Pulau Jerejak.—The station was in continuous use. The number of passengers detained for observation, sickness, &c., was 23,058 from 248 vessels. The maximum number in detention on a single day being 1,929, of whom 1,321 were from Negapatam under observation for small-pox. The average daily number in detention was 359.

Nineteen cases of small-pox were landed from vessels, and 6 other cases occurred among 2,420

contacts. No further cases of cholera and plague occurred among the contacts after the cases had been isolated.

Vaccinations to the number of 5,614 were done by the quarantine staff on the island.

Government Analyst's Department, Singapore.

(Report by Dr. Frankland Dent, M.Sc., Ph.D., F.I.C., Government Analyst.)

The work done by this Department continues to show a steady increase.

LIQUORS.

(*a*) *Samsoo.*—Six samples from Singapore were examined and reported upon.

(*b*) *Rum.*—Two samples from Singapore proved to be more or less artificial products made from silent spirit.

One sample from Malacca proved to be wholly bad, and the seller was fined $200 for supplying it at under the legal minimum strength laid down in section 109 (2) (*b*) of "The Liquors Ordinance 1906" and for using a false trade description under "The Merchandise Marks Act."

(*c*) *Brandy.*—One sample from Malacca was found to have been diluted with 34 per cent. of water.

(*d*) *Gin.*—One sample only was sent for spirit strength.

(*e*) *Chinese Imported Liquors.*—Twelve samples received for the determination of spirit strength showed in many cases a very high obscuration.

(*f*) *Medicated Wines.*—One sample from Singapore and three from Penang were sent for examination as to whether they should be classed as such in accordance with section 63 A (3) of "The Liquors Ordinance 1906 Amendment Ordinance 1907."

(*g*) *Methylated Spirits.*—One hundred and nineteen casks and 30 drums of spirit were methylated by the addition of pyridine. 767 cases of spirit were tested and certified as being properly methylated in accordance with section 3 of "The Liquors Ordinance 1906."

DELETERIOUS DRUGS.

(*a*) *Police Seizures.*—Fifty-three sets of exhibits were sent by the police. These comprised 1,434 separate articles, including packets of morphine and cocaine salts, hypodermic syringes and needles, mixing cups, ready prepared solutions of the alkaloids, &c.

In most cases the morphine hydrochloride was found to be mixed with varying amounts of milk sugar.

The total amount of pure morphine hydrochloride amounted to 2,344 gr., whilst the cocaine salt totalled 750 gr., the latter thus amounting to 24 per cent. of the total weight of alkaloids, which is slightly less than last year (30 per cent.).

(*b*) *Excise Seizures.*—Three sets were sent in by the Marine Police, the morphine was contained in twenty 1-oz. packets and the cocaine in eighty-eight $\frac{1}{8}$-oz. bottles.

(*c*) *Anti-opium Pills.*—Nine samples were sent in for examination, in all but one sample, opium was found to be present in considerable proportions.

(*d*) *Other Preparations.*—A white powder from Monthon Puket was found to be a mixture of morphine and quinine hydrochlorides containing 32½ per cent. of the former. A Chinese imitation chlorodyne contained chloroform but no opium.

TOXICOLOGY.

Stomachs, &c.—Twenty-six exhibits were received for the most part from the two Singapore hospitals.

Attempted Poisoning Cases.—In all, eight sets of exhibits were received for investigation. As is usual in such cases, they included exhausted tea-leaves, coffee dregs, curries, Chinese medicines, &c.

The most interesting case was one in which arsenic was found in certain sarongs saturated with vomit; it could not be proved, however, whether it owed its presence to the vomit or to the colouring matter contained in the sarong itself. Another case was one of poisoning fish, which were being conveyed by sea, by adding large quantities of washing soda to the water in the tanks containing them.

Attempted Robberies by use of Narcotic Drugs, &c.—Seven sets of exhibits were sent in under this head, they included joss sticks sprinkled with sawdust and pepper, cigarettes supposed to contain chandu, a mixture of pepper and quicklime, and a number of others. A "stengah," a small quantity of which was said to have produced a deep sleep in the person taking it, proved to be quite harmless.

Blood Stains.—Thirty-seven sets of exhibits were received from the Police, they included the usual parangs, bajus, &c.

Urine.—Fifty-eight samples were sent in chiefly for the detection and estimation of albumin and sugar, they included three samples for the determination of the "ammonia-co-efficient."

Milk.—Twenty-two samples were received for analysis, of these 2 were found to be a mixture of buffalo's and cow's milk, 3 were adulterated with water varying from 2½ per cent. to 24 per cent., 1 was admixed with both buffalo's milk and water, for which the manager of the company supplying it was fined $100, and 4 were tinned milks of average European quality. The rest of the samples were of good quality.

Water.—Of 16 samples received for sanitary analysis 9 came from Singapore, and of these 2 were reported as of good quality, 1 as highly contaminated by sewage, 1 as containing 2 per cent. of sea-water, and 5, taken from wells, as consisting for the most part of oxidized sewage. Two samples were received from Cape Rachado, and 1 each from Pulau Samboe, Perak, Johore, Rhio and Pulau Batam.

Complete mineral analyses were made in the case of samples from Saigon, Bangkok, and the Singapore Hot Spring.

Three samples were sent from Seremban for investigations as to their action on metal pumps, one of these was found to contain as much as 3½ gr. per gallon of free sulphuric acid.

Government Analyst's Department, Penang.

(Report by Mr. J. C. Cowap, B.Sc., A.I.C., Deputy Government Analyst, Penang.)

The laboratory was opened as part of an organized department on June 1, 1909, under Mr. J. R. Brooke, F.I.C., F.C.S.

The number of reports on general analytical work issued since then was 63, while that of the reports on petroleum tested was 42.

Methylated Spirits.—Five lots of spirit have been examined and certified to be methylated.

Chandu.—Seventeen samples of chandu prepared by the Farmer were examined. The chandu itself was of good quality in every case, but several of the smaller packets were found to be deficient in weight. On one occasion the weights used in the Farm Offices were tested and found to be correct.

Liquors.—Two samples of samsoo were examined and found to be of good quality. Five samples of spirits were sent by the police for identification and were shown to be samsoo. One sample of beer was examined and reported upon. Seven samples of toddy which were suspected of having caused dysentery were examined.

Deleterious Drugs.—Twenty sets of exhibits were received for examination from the police. These comprised 263 exhibits, consisting chiefly of hypodermic syringes, packets of drugs, cups, &c. The total amount of morphine hydrochloride thus dealt with was 676 gr., while the weight of cocaine hydrochloride was 263 gr.

Other Drugs.—One sample of chloroform was examined and reported upon. A bottle of Chinese "medicine" sent by the police for investigation proved to consist largely of assafœtida, and a much advertised remedy was found to contain a considerable amount of opium. The vendor was fined for selling this without a licence.

Water.—Two samples of water were examined, one of which, received from Province Wellesley, was reported as doubtful.

Milk.—Eight samples were received, chiefly from hospitals. One of these contained at least 8.3 per cent. of added water. Proceedings, which resulted in a fine of $100, were taken against the vendor. Of the remaining 3 were probably adulterated with water, but as the quality was above that of the low English standard no action could be taken.

Stomachs, &c.—Three stomachs in cases of suspected poisoning were received. These came from the Senior Medical Officer, Penang; Medical Officer, Province Wellesley; and Chief Police Officer, Penang. One was found to contain no poison, and the other two contained, respectively, opium and the poison from tuba root.

In addition the stomach of a horse, together with samples of food, &c., was sent in by the police, but nothing in any way suspicious was found.

Other Poisoning Cases.—In two lots of exhibits sent in connection with suicides chandu was found. In another case a gentleman suspected his food of having been poisoned, but the poison was shown to be ordinary washing soda. An infant's food suspected of having been tampered with was proved merely to have fermented. Another interesting case occurred in which several jars of drinking-water had been mixed with some substance apparently intended to poison. The substance was recognized as bamboo hair. A number of articles of clothing and the person of a prisoner were examined in an acid-throwing case.

Blood-stains.—Seven exhibits were sent in for examination. Blood was found on four of them.

Report of the Straits and Federated Malay States Government Medical School for 1909.

(Report by Dr. R. D. Keith, Principal.)

Twenty new students joined this course, of whom 7 were Chinese, 10 Tamils, 2 of other Indian races, and 1 Malay. Four joined as student assistant surgeons, 12 as holders of scholarships, and 4 as private students. Two had obtained the senior Cambridge certificate, 9 the junior, 6 passed the compulsory preliminary examination, and 3 passed partly the junior Cambridge examination and partly compulsory preliminary.

During the year classes have been conducted in all the subjects of the curriculum, including ophthalmology and lunacy. The results of the examinations have been satisfactory, except in the case of pharmacy; in these subjects the results were so very unsatisfactory that a new lectureship on the subject had to be instituted, with an honorarium of $500 per annum. Mr. G. W. Crawford, M.P.S., was appointed Lecturer. Over $500 were spent in obtaining the necessary apparatus, &c., for the teaching of this subject. The results appear to have justified the expenditure.

The conduct of the students during the year has been good on the whole. One student was suspended for three months for unbecoming conduct towards one of the lecturers, while others were fined small amounts for being absent without leave, neglect of duty, and such like offences.

The number of applications for admission is about the same as last year.

HOSPITAL ASSISTANT COURSE.

Seven hospital assistants completed the course and passed the examinations. One of these was a private student, 2 were for Selangor, 2 for Negri Sembilan, and 2 for the Straits.

Seventeen joined in 1909, of whom Perak sent 8, the Straits 4, Pahang 3, and 2 were paying students.

Three of those who joined in 1908 have not yet completed the course, making a total on the books of 20.

During the year botany, osteology, and chemistry were cut out of the course for hospital assistants, and practical instruction in dispensing, &c., was substituted, so that the course is now almost entirely a practical one.

Pathological Department.

(Report by Dr. G. A. Finlayson, Government Pathologist.)

LABORATORY.

During the year 1,258 specimens were examined, as compared with 4,265 during 1908. The great decrease is due to this factor, that no systematic examination of the blood of patients admitted into Tan Tock Seng Hospital with a history of fever is now carried out at the laboratory. Of the specimens forwarded for examination, 1,062 were sent in from the various Government hospitals, while 196 were submitted by private practitioners.

Widal Reaction.—In 1902 instances the reaction was positive, but in several cases a duplicate sample of blood was sent, so this number represents a somewhat smaller number of cases of enteric fever.

Tuberculosis.—In 65 samples of sputa forwarded for examination tubercle bacilli were demonstrated; in 99 no T.B. were observed.

Diphtheria.—The causal bacillus was seen in five instances. These cases occurred during the last two to three months of the year.

Gonorrhœa.—Thirty-two smears from urethral discharge were examined, and in 13 the typical intracellular diplococci were noted.

Various.—Several smears were examined in suspected cases of leprosy, but mostly with a negative result. Other specimens included 21 samples of urine for a report on the deposit, the presence or absence of T.B.B. Coli Comm., &c., 16 of fæces for the presence or absence of ova, amœbæ, &c., while 18 blood films were forwarded for differential leucocytic count.

Water—Municipal Supply.—Some 12 samples, taken at various intervals and at different standpipes, were examined during the year. The standard remains, as before, practically constant, the average number of organisms per c.c. being 82, varying from 48 to 120, while .05 c.c. occasionally, and .25 c.c. always, produced gas and acid in McConkey's medium.

GENERAL DISEASES.

Beri-beri.—There is no doubt that the case incidence and mortality of this disease has greatly diminished within the past few years. In 1905 and 1906 at Tan Tock Seng Hospital 190 patients died showing signs of beri-beri, while during the past year there were only some 94 cases.

Should the hypothesis of Dr. H. Schaumann and Drs. H. Fraser and Stanton be proved to be correct, undoubtedly a distinct advance will be made towards the eradication of this scourge.

Enteric Fever.—The mortality from this infectious disease shows a marked decrease as compared with 1908:—

The noticeable feature is the large percentage—50 per cent.—which died from an acute suppurative peritonitis, following the perforation of an ulcer. In fourteen instances the inflammation was general, while in one it was more or less limited to the site of the opening in the gut. As remarked in previous reports, quite a number of cases are admitted during the third and fourth week of the disease in almost a dying condition. Naturally such individuals have been disseminating typhoid bacilli in their evacuations for some weeks before their admission into hospital—a factor which medical officers engaged in preventive medicine have to consider and to contend against, in addition to the spread of the disease by convalescent typhoid carriers.

Malaria.—I can merely emphasize by reiteration the high death-rate from this preventable disease; 372 cases showed the malarial parasite present in the peripheral blood, and of these 289 died of the infection. Further, in 248 cases malarial pigment was demonstrated in the spleen, so that 620 cases, or 33 per cent. of all autopsies performed, showed that the individual was suffering or had previously suffered from malaria. Similarly, as noted in my last report, quite a considerable percentage died within 24 to 48 hours after admission.

Plague.—Only a few sporadic cases of the bubonic type occurred.

Cholera.—The majority of the cases occurred in the first quarter of the year, being simply a continuation of the epidemic which broke out at the latter end of 1908.

Malignant Disease.—A short report on such cases as have occurred during the past few years will be forwarded at an early date.

Dysentery.—A dysenteric condition of the gut is to be noted in a large percentage of the cases examined. From the figures annexed it will be observed that the lesions in the majority are caused by the pathogenic entamœba. In fourteen cases, or 4.5 per cent., were there associated an abscess of the liver. An acute inflammation of the peritoneal sac—suppurative or serofibrinous—was observed in twenty-five instances. This was due either to the perforation of an ulcer or to the gradual invasion and destruction of the wall of the bowel, when the inflammatory condition spread into the cavity by simple extension.

In nine cases the inflammation was quite general, but in the others it was more or less localized, with an attempt at the formation of plastic adhesions. Another noticeable condition in cases of a chronic type where there was a marked cicatricial sclerosis of the wall of the gut with narrowing of the lumen, and a dense thickening and drawing up of the mesentery—most marked in the pelvic colon—was the presence of a considerable quantity of a serous effusion into the peritoneal sac, while there was also a certain amount of œdema of the lower extremities. In my previous report I drew attention to the occurrence of patchy areas of pulmonary necrosis and sloughing, which are occasionally found in cases of chronic dysentery.

Some work is being done on this condition, but the organisms isolated are so varying in character that it would be premature to offer any definite opinion as to the causal agent.

Colonial Medical Reports.—No. 6.—Straits Settlements—(*continued*).

Pneumonia.—I ventured to suggest previously that the case incidence of this disease is higher in Tamils than in Chinese. Taking the admission returns of these nationalities into Tan Tock Seng Hospital in comparison I think this must be so—71 cases being noted in Chinese, while 33 occurred in Tamils. A few cases also occurred amongst Malays, Javanese, Bengalis, &c.

As usual, a number of cases were accompanied by an acute pericarditis, an empyema, or a suppurative peritonitis.

Biliary calculi were observed in forty-nine cases, and I may again draw attention to the point that undoubtedly malaria is predisposing to the formation of such deposits. In several instances an acute inflammation of the ducts or gall-bladder had supervened, leading to suppurative changes in the walls and in the hepatic substance.

It is most unusual to find a perforated tubercular ulcer, but this had occurred in two instances, giving rise to a general suppurative inflammation.

Report on the Medical Department, Labuan, for the Year 1909.

(Report by Dr. T. C. Cleverton, Medical Officer.)

Population and Health.—The following table shows the estimated population, and the birth- and death-rates, for the years 1906 to 1909:—

Year	Estimated population	Births	Deaths	Birth-rate per mille	Death-rate per mille
1906	8,317	116	161	13.94	19.35
1907	8,286	149	180	17.99	21.72
1908	8,245	172	213	20.82	25.83
1909	8,231	183	197	22.23	23.93

The estimated population, obtained from the figures recorded in the office of the Registrar, Births and Deaths, has steadily decreased since 1906. The population is estimated from the number of births and deaths reported only, no figures being available as to the number of immigrants and emigrants. It is my belief, moreover, that many births and deaths are not reported to the Registrar, especially those occurring amongst the Kadayans in out-lying districts. For these reasons the estimated population is to be regarded as a very approximate one. Penghulus were appointed in the Western District this year, and it is part of their duties to see that reports of births and deaths are sent to the Registrar. The birth-rate has steadily increased, on the figures recorded, since 1906.

STATISTICS OF POPULATION FOR THE YEAR 1909.

Number of inhabitants in 1908	8,245
,, births during the year 1909	183
,, deaths ,, ,, 1909	197
Number of inhabitants in 1909	8,231
Decrease	14

The death-rate has also steadily increased since 1906, with the exception that last year's (1908) death-rate was the highest recorded for the four years.

The following table shows the infant mortality under one year of age, with the percentage of this mortality to the death- and birth-rates for the years 1906 to 1909:—

Year	Total number of deaths under one year of age	Percentage of death-rate	Percentage of birth-rate
1906	66	40.99	56.89
1907	51	28.33	34.22
1908	67	31.45	38.95
1909	74	37.56	40.43

This table shows a very unsatisfactory return. The high mortality is largely due to faulty feeding and bad hygiene, and the Malays appear to be intolerant of any change for the better in this respect; moreover many of them consider that the children under one year of age are too young to take medicines.

The chief causes of death given are: (*a*) Fever 64; (*b*) pulmonary tuberculosis 25; (*c*) diarrhœa and vomiting 14; (*d*) marasmus 10; and (*e*) beri-beri 6.

Public Health.—No epidemic of infectious or contagious diseases has occurred on the island.

Port Health Work.—Twenty-one ships were examined before being granted "pratique." No ship or case was quarantined. The Quarantine Station, Pulo Papan, remains as it was last year with no buildings upon it except the lighthouse.

Malaria.—This shows a marked increase when compared with the previous year. The total number of admissions for malaria and its immediate effects in 1908 was 32, in 1909 it was 112. The type of malaria which predominates is intermittent, and of this type most of the slides examined showed tertian parasites (benign), often, too, in patients who clinically exhibited quotidian fever. This I took to be due to a double infection.

In connection with this the following comparison between the amount of rainfall in inches and the number of admissions for malaria may be interesting.

Dividing the whole year into thirds it is found that during the first four months the rainfall was 24 in., and the admissions for malaria were 22; during the second four months the rainfall was 49.13 in., and the admissions for malaria were 65; during the last four months the rainfall was 40.87 in., and the admissions for malaria were 25. The number of admissions during the last four months was doubtless influenced favourably by the large amount of quinine that was distributed during that time.

Anopheles larvæ have been found in pools near the police barracks.

Of the total number of admissions for malaria only two or three were Malays, and it is impossible to gauge the extent of this disease amongst them, as they neither seek treatment nor care for inquiries at their villages.

Beri-beri.—Twenty cases were treated in 1909 as against seventeen in 1908.

RETURN OF DISEASES AND DEATHS IN 1909 AT THE FOLLOWING INSTITUTIONS:—

Labuan Hospital; General, Pauper, Contagious Disease, Leper, Prison; Alor Gajah and Jasin Hospitals, Malacca, Straits Settlements.

GENERAL DISEASES.

	Admissions	Deaths	Cases Total Treated*
Alcoholism	2	—	3
Anæmia	39	4	43
Anthrax	—	—	—
Beri-beri	469	53	544
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	1	—	1
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	—	—	—
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	103	43	107
Enteric Fever	—	—	—
Erysipelas	2	2	2
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	24	—	24
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	—	—	—
Kala-Azar	—	—	—
Leprosy	8	—	10
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	—	—	—
(*c*) Mixed	—	—	—
Malarial Fever—	39	4	44
(*a*) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	347	20	356
Quartan	6	—	7
Irregular	—	—	—
Type undiagnosed	151	7	162
(*b*) Remittent	—	—	—
(*c*) Pernicious	—	—	—
(*d*) Malarial Cachexia	—	—	—
Malta Fever	—	—	—
Measles	1	—	1
Mumps	3	—	4
New Growths—	—	—	—
Non-malignant	3	—	3
Malignant	5	1	5
Old Age	—	—	—
Other Diseases	132	24	143
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	17	—	19
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	—	—	—
Sleeping Sickness	—	—	—
Sloughing Phagedæna	27	10	29
Small-pox	2	—	2
Syphilis	—	—	—
(*a*) Primary	2	—	2
(*b*) Secondary	173	9	191
(*c*) Tertiary	—	—	—
(*d*) Congenital	—	—	—
Tetanus	—	—	—
Trypanosoma Fever	—	—	—
Tubercle—	—	—	—
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—
GENERAL DISEASES—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	28	17	31
Varicella	—	—	—
Whooping Cough	—	—	—
Yaws	1	—	1
Yellow Fever	—	—	—

LOCAL DISEASES.

Diseases of the—			
Cellular Tissue	50	2	56
Circulatory System—	—	—	—
(*a*) Valvular Disease of Heart	19	6	21
(*b*) Other Diseases	4	—	4
Digestive System—	—	—	—
(*a*) Diarrhœa	39	20	39
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	4	—	4
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	—	—	—
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	1	—	1
(*g*) Cirrhosis of Liver	18	10	19
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	49	3	51
Ear	1	—	1
Eye	34	—	44
Generative System—	36	—	39
Male Organs	—	—	—
Female Organs	—	—	—
Lymphatic System	11	1	12
Mental Diseases	—	—	—
Nervous System	19	4	20
Nose	—	—	—
Organs of Locomotion	15	—	15
Respiratory System	118	56	123
Skin—	—	—	—
(*a*) Scabies	48	—	52
(*b*) Ringworm	—	—	—
(*c*) Tinea imbricata	5	—	5
(*d*) Favus	—	—	—
(*e*) Eczema	25	—	29
(*f*) Other Diseases	523	—	619
Urinary System	87	31	90
Injuries, General, Local—	—	—	—
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	119	3	122
Parasites—	74	27	80
Ascaris lumbricoides	7	—	7
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	1	—	1
Filaria medinensis (Guinea-worm)	—	—	—
Tapeworm	—	—	—
Poisons—	3	—	3
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	35	—	35
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

* These include the cases remaining in hospital at the close of the previous year.

LONDON SCHOOL OF TROPICAL MEDICINE.

39th Session. May-July, 1912.

Back Row.—G. B. Warren (Sen. Lab. Assistant), A. C. N. McHattie, A. B. Arora, H. B. Blaker, J. C. C. Hogan, W. J. Geale, E. S. Marshall, A. R. Neligan, H. Fleming, J. H. Baldwin, H. B. Rosair, P. W. Mathew, N. M. Gavin.

Seated.—C. A. Gourlay (Capt. I.M.S.), S. L. Brohier, Miss Payne, N. A. D. Sharp, H. B. Newham (Director), C. W. Daniels (Lecturer), G. C. Low (Lecturer), Col. A. Alcock, Miss Summers (Asst. Entomologist), H. M. Hanschell (Sen. Demonstrator), C. M. Wenyon (Protozoologist), R. O. Sibley (Demonstrator), R. N. Easton (House Surgeon).

Third Row.—R. H. Price (Major I.M.S.), A. D. J. B. Williams, J. L. Gilks, J. F. Corson, H. Emslie Smith (Capt. I.M.S.) A. A. C. McNeill (Capt. I.M.S.), W. Lapsley (Capt. I.M.S.), W. F. M. Loughnam (Capt. R.A.M.C.), W. Allan, G. F. Hunter, W. B. Wilson, W. Telfer, F. C. McCombie, W. P. Chamberlain (Major Med. Corps U.S. Army), T. Fraser, Robert (Lab. Asst.).

On Ground.—A. H. Owen, B. Spearman, S. F. Johnson, J. E. L. Johnston, R. Hoffmann.

Absent.—R. T. Leiper (Helminthologist), F. R. S. Milton (Sen. H.S.), A. T. Stanton, A. R. J. Douglas, Carlos Monge, C. L. Strangman, C. S. Hawkes, G. H. Monrad-Krohn, G. G. Butler, H. R. Brown (Major I.M.S.), G. I. Davys (Capt. I.M.S.), F. D. Browne (Major I.M.S.) L. Smith, W. G. Watt, N. H. Bronnum, W. M. Nairn, A. Powell, A. H. Barclay, Maj. W. A. C. Cockburn, T. Hood-Rankin, C. W. O'Keeffe, C. H. D. Ralph, D. Burrows, A. C. Parsons, P. N. Pope, A. E. Evans, H. L. Lamb, M. D. Reece, D. A. Ashton, E. D. Vergette, C. H. Allan.

LONDON SCHOOL OF TROPICAL MEDICINE

(UNIVERSITY OF LONDON),

Under the Auspices of His Majesty's Government,

CONNAUGHT ROAD, ALBERT DOCKS, E.

In connection with the Albert Dock Hospital of the SEAMEN'S HOSPITAL SOCIETY.

THE SEAMEN'S HOSPITAL SOCIETY was established in the year 1821 and incorporated in 1833, and from time to time has been enlarged and extended. It now consists of the Dreadnought Hospital, Greenwich, to which is attached the London School of Clinical Medicine; the Royal Victoria and Albert Docks Hospital; the East and West India Docks Dispensary; and the Gravesend Dispensary.

Over 30,000 Patients treated annually. Of this number many are Cases of Tropical Disease.

The School buildings are situated within the grounds of the Royal Victoria and Albert Docks Hospital.

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LECTURES AND DEMONSTRATIONS DAILY BY MEMBERS OF THE STAFF.

There are three Sessions yearly of three months each, viz., from October 1st to December 31st, from January 15th to April 14th, and from May 1st to July 31st inclusive. Women Graduates are received as Students.

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Students can be provided with Board and Residence, or partial Board, at the School.

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Students of the London School of Tropical Medicine, who join the London School of Clinical Medicine, will be allowed an abatement on their fees and *vice versâ*.

Chief Office—SEAMEN'S HOSPITAL, GREENWICH, S.E.

Venereal Diseases.—Thirteen were treated in hospital in 1909 as against three in 1908. In addition a few cases were treated as out-patients.

Pulmonary Tuberculosis.—Ten cases were treated in hospital in 1909 as against five in 1908.

Dysentery.—Seven cases were treated in hospital in 1909 as against two in 1908.

General Sanitary Condition.—The drainage of the town of Victoria has been improved, but it is still far from satisfactory. The night-soil is removed daily in metal buckets and carried across the harbour outside the suburban limits by the Sanitary Board's Contractor, who sells it to the Chinese gardeners for manure. The town refuse is collected daily and deposited in a place approved by the Sanitary Board, in grounds at the junction of Plain and North Roads, where there are pits to be filled in.

Vaccination.—The total number of vaccinations was 347, as against 290 in 1908. In both years there were more vaccinations than there were births registered. Of those vaccinated 104 were infants of 3 months and under, 49 were children between the ages of 3 months and 1 year, and 194 were persons 1 year of age and over. Of the total number performed, 86 were done by a private medical practitioner.

Of the total number 300 were successful, 44 were unsuccessful, and 3 failed to report.

Early in the year two consignments of lymph failed to take effect, otherwise the lymph supplied was satisfactory.

Meteorological.—During the first three months of the year the N.E. Monsoons prevailed, and the rainfall during these three months was less than that during any other three months of the year. Total rainfall 1909 was 114.00 in. Total rainfall 1908 was 165.07 in.

The wettest month was June, when 16.56 in. fell.

METEOROLOGICAL RETURN FOR THE YEAR 1909.

	Temperature				Rainfall		Winds
	Shade maximum	Shade minimum	Range	Mean	Amount in inches	Degree of humidity	General direction
	F.	F.	F.	F.	Ins.	Per cent.	
January...	85.12	77.54	7.58	83.28	3.98	72.45	N.E.
February	84.64	76.21	8.43	82.66	6.99	76.09	N.E.
March ...	86.19	76.67	9.52	83.44	5.78	71.35	N.W.
April ...	87.10	78.00	9.10	84.30	7.25	67.45	S.W.
May ...	88.60	77.58	11.02	83.38	11.23	68.90	S.W.
June ...	85.80	76.83	8.97	83.47	16.56	68.86	S.W.
July ...	87.19	75.45	11.74	82.11	6.95	70.19	S.W.
August ...	87.38	76.25	11.13	82.55	14.39	73.03	S.W.
September	86.86	75.13	11.73	83.51	7.70	67.80	S.W.
October ...	88.74	77.90	10.84	83.25	14.50	68.19	S.W.
November	85.83	79.16	6.67	85.75	9.31	71.16	S.W.
December	84.54	74.59	9.95	82.90	9.36	69.67	S.W.
Total ...	1,037.99	921.31	116.68	1,000.40	114.00	845.94	
Monthly Average	86.49	76.77	9.72	83.36	9.50	70.49	

The greatest rainfall for twenty-four hours was 3.18 in. The highest temperature recorded was 91° F. The lowest temperature recorded was 70° F.

The Hospital.—The total number of patients treated during 1909 was 307, as against 167 in 1908, 183 in 1907, and 164 in 1906. The excess in the number of cases treated this year is largely attributable to the greater number of admissions for malaria; six remained in hospital at the end of the year.

The daily average number of sick was 11.6. The chief diseases treated were: Malaria and its immediate effects 112, beri-beri 20, venereal diseases 13, pulmonary tuberculosis 10, dysentery 7, and accidents 8.

The number of operations done under chloroform was 20.

The number of deaths in hospital was 17; the percentage of deaths to cases treated in hospital in 1909 was 5.53, in 1908 the percentage was 13.17, in 1907 it was 13.11, and in 1906 it was 10.36. The great improvement in the mortality percentage in 1909 is more apparent than real, as a great number of the cases of admissions were amongst the police, who, for various reasons—the chief being that they recover more quickly in hospital—are admitted to hospital for more trivial complaints than other classes of the community. Taking this into consideration, however, there was a distinct improvement in the mortality percentage during 1909, due to the fact that fewer patients were admitted moribund. Also fewer serious accidents occurred at the coal-mines during 1909. The chief causes of death were: Pulmonary tuberculosis 6, malaria 3, and dementia, apparently following malaria, 2.

Only one death occurred amongst the twenty cases of beri-beri, but many of the cases were very protracted.

The Police.—The general health of the police during the year 1909 has been unsatisfactory. Almost all the members of this force have suffered from malaria fever, with consequent anæmia, dyspepsia and debility. Quinine has been freely distributed to the individual members, and when it was suspected that some of them were either giving away, or selling the quinine, the members were persuaded to take it twice a week under the direct supervision of the Medical Department. The Government provided mosquito curtains to the individual members in September. The cases of malaria were considerably reduced in September, October and November, but in December the number of cases began to rise again, chiefly amongst the Sikhs and Indians. The stagnant pools in the vicinity of the police barracks and gaol were treated periodically with petroleum after September. Since September it has been my practice to treat with quinine every patient amongst the police suffering from malaria for one month after the last attack of fever. I find 12 gr., given twice a week, sufficient to prevent a relapse in most cases.

Colonial Medical Reports.—No. 7.—Seychelles.

MEDICAL REPORT FOR THE YEAR 1909.

By J. B. ADDISON.

Chief Medical Officer.

Vital Statistics.—The estimated population of the Colony on December 31, 1909, was 22,409, an increase of 427 on 1908. The birth-rate was 33.60 higher than that of 1908, which was 32.20. The death-rate was 15.48 lower than that of the preceding year, which was 16.24. The number of children who died under the age of five years was lower this year, viz., 110; last year the number was 127. The percentage of infantile mortality is over 31 per cent. of the total amount of deaths of the whole Colony. There were 46 still-births and 14 twin births.

	Males	Females	Total
Estimated Population on December 31, 1908	11,236	10,746	21,982
Births during 1909	392	361	753
	11,628	11,107	22,735
Arrivals during 1909	287	63	350
	11,915	11,170	23,085
Decrease by Deaths	186	161	347
	11,729	11,009	22,738
Decrease by Departures	255	74	329
Estimated Population on December 31, 1909	11,474	10,935	22,409
Net Increase during 1909	232	195	427

Birth-rate during 1909 ... 33.60 per thousand.
Death-rate ,, ,, ... 15.48 ,, ,,

AGES AT WHICH DEATH HAS OCCURRED DURING THE YEAR 1909.

Under one year		1 to 5 years		6 to 70 years		70 to 100 years		Over 100 years		Total	
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
36	21	23	30	108	91	19	18	—	1	186	161
57		53		199		37		1		347	

Meteorological Statistics.—The mean temperature for the year was 79.3° lower than 1908, which was 80.6°. April was the hottest, and August the coolest month of the year. The total amount of rain that fell during the year was 79.95 in. January shows 18.70 in., and August only 0.33. January, February, April, and November gave between them 56.14. The amount of rainfall in 1908 was 64.94 in.

Diseases prevalent during the Year.—The most important medical event during the year was an outbreak of small-pox among some native passengers at the Quarantine Station and the occurrence of an isolated case in the town of Victoria. The D.O.A.L. steamer *Reichstag* arrived from Bombay on February 4 with twenty-eight native passengers for this port. The vessel bore a bill of health annotated "Sporadic Small-pox." She was placed in quarantine and the passengers were sent to the Quarantine Station at Long Island. Three days afterwards a case of small-pox was discovered among one of these passengers; steps were immediately taken to isolate this case in order to prevent the spread of the disease, and all other people at the station were vaccinated; but in spite of these precautions eleven other cases broke out. All of the cases were of a mild type and there was no fatality. The epidemic died out and quarantine was raised on March 16. On February 22 a case was discovered in the centre of the town of Victoria; it occurred in a man who had arrived two months previously from Madagascar. It was impossible to establish any connection whatsoever between this case and the outbreak at the Quarantine Station. The case was of a somewhat severe type. The man was living right in the midst of the most crowded part of the town, and great fears were entertained that other cases would occur. A small island situated quite close to the Quarantine Island was taken as a second Quarantine Station and the man was immediately removed there with suitable guardians. The house in which the patient lived was situated in a sort of courtyard and other houses were built round this courtyard. The occupants of all these houses were considered to be contacts; they were all removed to an isolation camp which was instituted on a piece of Government ground situated at about $1\frac{3}{4}$ miles from the centre of the town and known as Plaisance Camp, and all were vaccinated.

METEOROLOGICAL RETURN FOR THE YEAR 1909.

	Temperature						Rainfall		Winds		
	Solar maximum	Minimum on grass	Shade maximum	Shade minimum	Range	Mean	Amount in inches	Degree of humidity	General direction	Average force	Deaths
January	148.7	72.6	82.6	76.1	6.5	79.3	18.70	74.6	N.W.	6.5	30
February	143.7	72.6	82.9	76.9	6.0	79.9	16.65	74.8	N.W.	4.0	25
March	148.5	73.0	84.5	77.8	6.7	81.1	1.39	75.2	N.W.	5.1	31
April	155.8	73.6	85.7	78.0	7.7	81.8	10.33	76.2	S.	4.2	31
May	147.1	72.7	83.4	77.4	6.0	80.4	2.97	74.1	S.E.	8.7	29
June	146.4	72.2	81.6	76.6	6.8	79.1	1.43	73.1	S.	9.8	22
July	144.7	66.1	80.3	75.0	6.6	77.6	1.43	72.2	S.E.	11.9	31
August	145.3	73.6	79.8	74.9	5.4	77.3	0.33	71.0	S.E.	12.6	27
September	148.3	73.0	81.4	76.4	3.4	78.9	1.62	72.9	S.E.	13.4	15
October	148.4	66.3	81.9	76.2	5.2	79.0	5.63	73.3	S.E.	10.5	27
November	140.9	71.8	82.3	75.3	6.6	78.8	10.46	74.7	S.E.	5.1	32
December	143.0	72.7	83.1	75.8	7.3	79.4	9.01	74.0	N.W.	3.5	47

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Entry into the courtyard where the case occurred was forbidden to the general public, and all the houses in it were subjected to sulphur fumigation for several days. Five special sanitary inspectors were appointed to pay daily visits to all quarters of the town to look out for other further cases. Fortunately there were no further cases. The Assistant Medical Officer, Dr. Power, was put on special duty to look after the cases at the Quarantine Station and also the case from town. The general health of the population during the year was good; except for two mild epidemics of influenza there was nothing noteworthy. Ten cases of beri-beri were admitted to the Victoria Hospital during the year; they all came from St. Pierre Island, and were mild in type. There were several cases of pulmonary tuberculosis during the year, but the rapid increase in the number of cases which had been noted during the previous two years does not seem to have been maintained.

Town of Victoria.—The new water supply which has been brought from Le Niol has been working since the month of March. This has greatly increased the amount of water available and has proved thoroughly satisfactory. The night soil service has been satisfactorily performed.

I am glad to find that the Assistant Medical Officer of South Mahé has found in his district, as I have found in the central district, that the increase in the number of cases of pulmonary tuberculosis which had been noted in former years was not maintained in 1909.

I am of opinion that the amount of dyspepsia that the Assistant Medical Officer Praslin has found in his district is rather due to anæmia caused by ankylostomiasis than to the food the people eat.

Vaccination.—The lymph has given very good results. Three hundred and forty-eight children were vaccinated in the central district with only two failures. Revaccination of the whole population was undertaken, but the measure has not yet been carried out in the south district and the outlying islands. The total number of persons re-vaccinated was 7,265, and the percentage success was 71.

Quarantine.—The Quarantine Station was used on several occasions during the year. The Recks' steam disinfector was removed from the Quarantine Station, and was placed on Hodoul Island (an island in the inner harbour of Victoria). In its new position it is very much more useful.

Hospital and Dispensaries.—During the year the Victoria Hospital was very greatly improved and put on the lines demanded by modern science. The most important addition was an operating theatre, previous to this all operations had to be performed on the verandah and it frequently happened that operations had to be postponed on account of bad weather, the only alternative to the verandah being a very badly lighted room. For the purpose of making the theatre, two rooms, one of which was used as a laboratory and the other as a store room, were knocked into one and thus a good room obtained; the walls and floor were cemented, top and side lights arranged for, and the necessary furniture obtained from England. The result is highly satisfactory. Operations can now be undertaken with confidence which formerly were attended with much risk. The third-class ward was thoroughly repaired, the old wooden floor was taken up and replaced by cement and the whitewashed walls covered with cement and painted. The old rope beds were replaced by iron beds, bed-lockers were provided and the ward was ceiled, and now leaves nothing to desire. A store room for drugs was built behind the Government Pharmacy, thus setting free a room which was used for this purpose at the hospital, the dividing wall between this room and a room next to it, and which was formerly a dirty, badly-ventilated room, known as the prison; these two rooms together were ceiled, cemented and floored, and a bright airy ward of six beds thus made. The female ward was treated on the same lines as the third-class ward and is greatly improved. Bath rooms were provided for the patients. The *post-mortem* room was rebuilt in a new and more convenient position and provided with a cement table. It is hoped that when funds are available something may be done to provide better first-class quarters and to repair the second-class ward, but as these wards are not much used in comparison with the other wards the matter is not pressing. The number of patients who have received free treatment as out-patients at the Victoria Hospital was 3,584, a large increase on that of the preceding year, which amounted to 3,006. The number of out-patients treated at the District Dispensaries were less than those of 1908, the Medical Officers were absent from their Districts. The in-patients treated at the Victoria Hospital were 388, an increase of nine when compared with the preceding year. There were 26 deaths, giving a percentage of 6·7, and lower than 1908. A much needed addition was made in the Nursing Staff, in the shape of a new thoroughly trained nursing sister.

RETURN OF PATIENTS TREATED AT THE PUBLIC DISPENSARIES.

Month	Victoria Hospital		Anse Royale		Anse Boileau		Praslin	
	M.	F.	M.	F.	M.	F.	M.	F.
January	63	132	—	—	—	—	—	—
February	80	166	—	—	—	—	—	—
March	75	186	—	—	—	—	—	—
April	65	160	—	—	—	—	11	15
May	76	265	—	—	—	—	9	15
June	70	221	15	21	—	—	4	12
July	81	238	12	22	—	—	3	9
August	79	238	20	29	—	—	12	10
September	58	182	27	27	2	8	7	8
October	85	316	26	31	2	4	10	4
November	90	299	22	16	—	—	11	3
December	89	270	19	20	1	2	6	2
Total	911	2,673	141	166	5	14	73	78

= Total 4,070.

RESULT OF CASES TREATED AT THE VICTORIA HOSPITAL.

Sexes	Remaining in hospital at the end of 1908	Admitted during 1909	Total treated	Cured	Relieved	Unrelieved	Died	Remaining at the end of 1909	Total	Remarks
Males	20	286	306	213	45	16	19	13	306	
Females	1	81	82	49	9	10	7	7	82	
Total	21	367	388	262	54	26	26	20	388	

Return of Diseases and Deaths in 1909 at the Victoria Hospital, Seychelles.

GENERAL DISEASES.	Admissions	Deaths	Total Cases Treated*
Alcoholism	1	1	1
Anæmia	6	—	6
Anthrax	—	—	—
Beri beri	10	—	10
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	—	—	—
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	10	—	10
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	9	—	10
Enteric Fever	—	—	—
Erysipelas	1	—	1
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	6	—	6
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	13	—	13
Kala-Azar	—	—	—
Leprosy	—	—	—
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	—	—	—
(*c*) Mixed	—	—	—
Malarial Fever—	—	—	—
(*a*) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	—	—	—
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	1	—	2
(*b*) Remittent	—	—	—
(*c*) Pernicious	—	—	—
(*d*) Malarial Cachoxia	—	—	—
Malta Fever	—	—	—
Measles	—	—	—
Mumps	—	—	—
New Growths—	—	—	—
Non-malignant	—	—	—
Malignant	—	—	—
Old Age	18	6	19
Other Diseases	—	—	—
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	10	—	10
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	—	—	—
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	—	—	—
Syphilis	6	—	8
(*a*) Primary	—	—	—
(*b*) Secondary	—	—	—
(*c*) Tertiary	—	—	—
(*d*) Congenital	—	—	—
Tetanus	2	2	2
Trypanosoma Fever	—	—	—
Tubercle—	—	—	—
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—
General Diseases—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	—	—	—
Yaws	—	—	—
Yellow Fever	—	—	—
LOCAL DISEASES.			
Diseases of the—			
Cellular Tissue	66	—	71
Circulatory System—	—	—	—
(*a*) Valvular Disease of Heart	17	5	18
(*b*) Other Diseases	4	—	4
Digestive System—	—	—	—
(*a*) Diarrhœa	—	—	—
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	3	—	3
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	—	—	—
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	2	—	3
(*g*) Cirrhosis of Liver	—	—	—
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	34	3	35
Ear	1	—	1
Eye	5	—	5
Generative System—	—	—	—
Male Organs	10	—	10
Female Organs	19	4	19
Lymphatic System	2	—	2
Mental Diseases	—	—	—
Nervous System	13	1	13
Nose	—	—	—
Organs of Locomotion	5	—	8
Respiratory System	29	2	30
Skin—	2	—	2
(*a*) Scabies	—	—	—
(*b*) Ringworm	—	—	—
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	—	—	—
(*f*) Other Diseases	—	—	—
Urinary System	10	—	10
Injuries, General, Local—	33	—	35
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	—	—	—
Parasites—	3	—	3
Ascaris lumbricoides	5	—	5
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	4	1	5
Filaria medinensis (Guinea worm)	—	—	—
Tape-worm	—	—	—
Poisons—	—	—	—
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	—	—	—
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

* These include the cases remaining in hospital at the end of the preceding year.

Medical Report of the Assistant Medical Officer, John T. Bradley.

THE health of the district during 1909 was good, and compares favourably with that of other years. There was no infectious disease prevalent except influenza, which caused one death, and diseases of the intestinal tract were not prevalent, there being only one death from dysentery and three from gastritis.

The health of little children suffered a good deal, and, as in past years, a good deal of the suffering of little children is due to the ignorance of the mothers and nurses, who neglect the simplest precautions with regard to the proper preparation of infants' food, and children are often reared on food quite unsuitable to their years. Thirteen children under 1 year of age died during the year, and seven under 5 years, *i.e.*, more than one-third of the deaths in the district occurred in children under 5 years of age. As the mothers of the children are quite ignorant as regards infant feeding, and there is now in the colony a number of good schools, where education has been brought within the reach of even the poorest, a few lessons in hygiene and infant feeding to the bigger girls prior to leaving school would help to combat this evil.

The Victoria Hospital, with its new operating theatre, is a great help to country patients. With roads which are in good condition transport is easily carried out, so that within three hours any grave accident can be forwarded for operation and treatment.

Tuberculosis.—In nearly every report I have alluded to this disease, formerly I drew attention to the great inroads it was making, and that the Créole population seemed very susceptible to the disease. During the year 1909 there were six deaths from phthisis, that is, one person in nine that died in South Mahé was suffering from this dread disease. I am, however, of opinion that the disease is not spreading as rapidly as it was in former years, and that with proper precautions the disease can be kept in check.

I think it advisable that the people should be warned of the danger of drinking milk from tubercular cows, and that strict regulations with regard to milch cows and the inspection of milk should be enforced.

Syphilis.—For a good many years this disease was not common, lately it seems to have displaced gonorrhœa from its "pride of place," and as the disease is one that seriously affects the vitality and health of the population, it is one that I think it necessary to draw special attention to. It is also unfortunate that the principal people attacked are the young males of well-to-do families; the outlook for the colony cannot be favourable if the bulk of the young males are inoculated with this fearful scourge. The ignorance with regard to its effects are appalling. Gonorrhœa they are used to, but this disease, which undermines and breaks down their constitution, they cannot understand, with results that are serious to contemplate not only for themselves, but their offspring.

In passing through the country districts one is impressed with the great number of people suffering from anæmia. There may be no loss of weight, but if they are white people they have a peculiar waxy-yellow complexion, with well-marked anæmia. From a long series of examinations of the fæces I find that all these people are suffering from anæmia due to ankylostomum duodenale.

As in country districts, there is little or no sanitation, and taking into account the great danger to the health of the community from this parasite, steps should be taken to point out the nature of the disease and a few simple directions given as to the best manner to combat it.

The native of African origin, and at times his white neighbour, uses a good deal of native drugs. The plants have certain therapeutic effects, and I have endeavoured during the past few years to get their names, as well as the disease for which they are employed.

The following is a short list of the principal plants employed:—

Créole name	Natural orders, *vide* Baker, "Flora of Mauritius and Seychelles, 1877"	Diseases in which they are employed
Afouche rouge	*Moreæ Ficus rubra*	Dysentery
Ananas vert	*Bromeliaceæ*	To procure abortion
Badamier	*Combretaceæ terminalia catappa*	Dysentery
Bambous (feuilles)	*Gramineæ bambusa arundinaceæ*	Worms
Resine Bois Takamaka	*Guttiferæ, Calophyllum inophyllum*	Ulcerated legs
Café Marron	*Meliaceæ Quivisia oppositifolio*	Gonorrhœa
Canellier (feuilles)	*Lauraceæ cinnamomum*	Fever
Casse puante	*Leguminesæ cassia occidentalis*	Leaves for a poultice to ulcers, internally for worms
Citronelle	*Graminæ andropogon schœnanthus*	Fevers of all sorts
Cocotier	*Palmeæ cocos nucifera*	Roots—Cystitis gonorrhœa Shell—when burnt, for toothache
Gingembre	*Zingiberaceæ*	Colic
Herbe cochon	*Comme lynaceæ*	A cooling drink, and for cystitis
Herbe chatte	*Euphorbiaceæ*	Attacks due to nervous disorders
Herbe dure	*Malvaceæ, Sida cordefolia*	Most common plant used for making poultices
Langue de bœuf	*Filices asplenium nidus*	Coughs, influenza
Madam Tombé	*Labiatæ leucas aspera*	Bronchitis and coughs
Barbe de mais (Stigmates)	*Gramineæ Zea Mays*	Gonorrhœa, cystitis
Manioc	*Euphobiaceæ Manihot utilissima*	The flour is much appreciated, as it makes an excellent poultice
Papayer	*Passifloraceæ carica papaya*	Worms
Poc-poc	*Sapindaceæ*	As a cooling and refreshing drink
Stramonium	*Solanaceæ Datura*	Asthma
Racina Vetyver	*Graminæ andropogon muricatis*	Stimulant, and as a refreshing drink.

The births for the year were 160, the deaths 54, there being an increase in population of 106. This increase, added to increases from 1902 to 1908, gives a net increase of 837 during the past eight years.

1901	Census of that year, Population	4,203
1902	Estimated population to December 31, 1902	4,301
1903	,, ,, 1903	4,404
1904	,, ,, 1904	4,496
1905	,, ,, 1905	4,611
1906	,, ,, 1906	4,716
1907	,, ,, 1907	4,700
1908	,, ,, 1908	4,797
1909	,, ,, 1909	4,800

In order to avoid errors, as there are several score of labourers at present working in the outlying islands, for statistical purposes I have fixed approximately the population for 1909 at 4,800.

With an estimated population of 4,800 the death-rate for 1909 was 11.25. Leaving out the deaths of children under 5 years, we have a good many people who died at a respectable old age, and one over ninety. Compared with 1908, there has been a diminution of five in the number of deaths, *viz.*, 59 deaths in 1908, and 54 in 1909.

The principal diseases causing death are as follows: Anæmia, probably secondary to ankylostimiasis, 3; asthma 5; endocarditis 2; gastritis 3; infantile marasmus 8; leprosy 2; phthisis 6; senile decay 5; syphilis 2; and tetanus 2.

In 1907 there were fifteen stillbirths, which at the time I considered quite abnormal and probably due to faulty midwives, for 1908 the number is six, and for 1909 it is five. These may be regarded as normal, and calls for little or no criticism.

The birth-rate for 1909 was fairly well maintained, being 33.33 per thousand of estimated population. There is no doubt that there is a slight diminution of the birth-rate; commencing in this district the population is steadily increasing, yet since 1906 the birth-rate is commencing to decline. In 1903 there were 169 births, in 1904 there were 155, and instead of an upward tendency due to an increased population, there is a tendency for the birth-rate to remain stationary and even commence to drop slightly.

The number of marriages for 1909, *viz.*, thirty-three, was quite normal, and I attribute it to an increase in prosperity due to the vanilla and coconuts selling well in 1909, the result being that several young people get married, on the idea that they could easily keep house with the extra increase in wages.

Dispensaries of Anse Royale and Anse Boileau.

Medical assistance, as in past years, was afforded to the poor of the district at Anse Royale on Mondays, Wednesdays, and Fridays; and at Anse Boileau on Tuesdays. In this report I have not included the attendance at Anse Boileau, as it only comprises about fifteen persons for the months of October, November and December.

Every Tuesday at the Anse Royale dispensary there is free vaccination; the quality of the lymph supplied was satisfactory, and gave good results. The number of children vaccinated was 136. Only two were unsuccessful.

There were no important police cases during the year, a few slight assaults and those of a trivial nature. There were eight cases at Anse Royale, and three at Anse Boileau.

The new lunatic asylum was finished in 1909, and it gives me pleasure to report that both male and female departments are airy and well-built, and are situated in the midst of well-kept gardens and grounds. There is every modern convenience in the asylum, a good and liberal supply of pure mountain water, laid on with pipes to bath-room and kitchen; the sanitary arrangements are good, and in all cases the comfort and convenience of the patients has been consulted.

As regards the building itself, it is built in stone, with large chambers, which are well ventilated, and compares very favourably with buildings of the same style and model in Europe.

I am certain that not only the patients, but their relatives and friends, will highly appreciate having such an institution in their midst, instead of as formerly, when patients had to be sent to Mauritius, hundreds of miles of distance from their homes and families, with perhaps a separation for years or for ever. The patients are now treated in the midst of familiar surroundings; they are visited by their relatives and friends; all this unites to keep up their interest in outside affairs, and keeps intact that tie with their family and the world, which is so important once a patient is discharged and takes his place as a member of the general community.

The health of the inmates was good during the year, there were no deaths nor infectious diseases in the asylum, and in almost all cases there was a marked improvement physically in the health of the patients.

During the year there were twelve males and two females admitted to the asylum—this includes three males transferred from Mauritius in December. Four males were discharged, three as cured, and one patient was discharged. In addition, at the end of the year there were two males and one female out on trial, which is the state preliminary to that of discharge, so that for 1909 six males and one female may be looked upon as recovered, a good percentage when the number of patients in the asylum is taken into account.

Steps have been taken to awaken the interest of the patients to their surroundings. This consists in a weekly dance, and one day in the week a magic lantern performance. In addition, trips to objects of interest in the neighbourhood, supervised by the attendants, are carried out once a week. The male patients are encouraged to grow flowers and plant vegetables and other agricultural products in the grounds, while the female patients are employed in straw-plaiting and in sewing. On wet days, and when the sun is too strong, patients are encouraged to amuse themselves indoors, when they have dominoes, draughts, and other games to keep their attention employed.

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Instead of contracting for the dieting as in past years, arrangements have been made from January 1, 1910, to do all the cooking in the asylum. This is a good deal more satisfactory, besides being more economical, as the individual tastes of the patient can be consulted, and the quality of the food supplied can be better controlled.

In both male and female departments the head and sub-attendants have discharged their duties with satisfaction, and have shown that they take an interest in the welfare of the patients. The Head Attendant, Male Department, has discharged the duties of his post with tact and intelligence, and his attention to the welfare of the patients has much contributed to their comfort, and he has worked hard to brighten the lives and bring a ray of happines into those minds which are so often behind a cloud.

The districts under my charge may be divided into:—

(1) Praslin Island.
(2) La Digue Island.
(3) Round Island, Pauper Camp, and Leper Asylum.

The health of the whole district has been remarkably good, no epidemics of any sort having prevailed during the year.

The only disease in this district which could be stated to be of a epidemic nature is influenza. A few cases of this disease are always cropping up, but nothing like an epidemic has occurred.

One case of leprosy was discovered in Praslin, and was caused to be isolated by relatives under the terms of the new ordinance. It is difficult to find if the disease is prevalent or otherwise, as it is always hidden away as effectually as possible by the sufferer himself and by his friends.

As regards the theory of its being caused by an exclusive diet of rice and salted or indifferently preserved fish, which is the staple food of the people here, it seems to me that this diet, being an unnutritious one, may predispose to the disease, but not be the actual cause of it. If any other diet equally lacking in nourishment were substituted, leprosy probably would be as prevalent as ever, whereas, if the diet were improved, the constitution would have a greater chance of resisting the microbe when it attacked the system.

The present methods of isolation and segregation ought to aid materially in stamping out this disease.

No cases of malaria which originated in Seychelles were met with. A few cases of recurrent attacks of this disease were met with in Indians who had contracted it elsewhere.

By far the most common disease of the inhabitants of this district is dyspepsia, caused by the eating of large quantities of indigestible unnutritious food. This in turn leads to decomposition in the intestines, and so great distension with constant excessive internal abdominal pressure, which I think may be one of the causes of hernia, which is very prevalent.

Intestinal parasitic disease, next to dyspepsia, is the most common ailment, especially among children, very few not being affected.

Ankylostomiasis also prevails, especially at La Digue.

Three cases of phthisis were noted, two in Chinese shopkeepers and one in a Creole. All these cases occurred in Praslin. Tabes mesenterica, or tuberculosis of the abdominal glands, is rather common at La Digue. Reference to the death registers shows that a good number of the deaths of children in La Digue are due to this disease in previous years.

Asthma is prevalent, especially among the black population, very few cases having been met with in half-castes or whites.

Chronic rheumatism is prevalent, especially in the aged, probably on account of the damp nature of the climate. A few cases of rheumatic fever have also been noticed.

All serious cases, and those requiring operative interference or hospital treatment, were sent to Mahé for treatment at the hospital in Victoria, there being no hospital in this district. The voyage to Mahé over a sea which is generally very rough, probably in a small sailing boat which may take any time from six hours to four or five days under a blazing sun or pouring rain to reach its destination, naturally militates greatly against the sufferer's chance of recovery, and points to the need of the erection of a small hospital in Praslin, a need which increases every year with the growth of the population.

Vaccination.—The lymph sent from Mahé was invariably fresh and active, and kept in good condition for several weeks. During the year 106

TABLE SHOWING CONDITION AS TO MARRIAGE, PROBABLE CAUSE OF INSANITY, MENTAL DISEASE, AND OCCUPATION OF PATIENTS.

Condition in reference to marriage	Males	Females	Probable causes of insanity	Males	Females	Form of insanity	Males	Females	Occupation	Males	Females
Married ...	5	5	Moral	5	2	Mania	7	4	Clerks	2	—
Single ...	8	1	Physical	1	2	Melancholia	2	1	Labourers	9	—
Widow ...	—	1	Parturition or the puerpural state	—	1	Puerpural Insanity ...	—	1	Sailor	1	—
Widower ...	—	—	Alcohol	—	1	Folio Circulaire ...	1	—	Washerwomen	—	4
			Heredity	1	1	Imbecile	—	1	Proprietor or Merchant	1	1
			Syphilis	2	—	Epileptic	—	—	No profession	—	2
			Unknown ...	4	—	Dementia	3	—			
	13	7		13	7		13	7		13	7

children were vaccinated. They were all successful the first time.

The total number vaccinated at the three different dispensaries was 106.

Praslin Island.

The island is 9,700 acres in extent, and is very hilly. All the flat land, which extends from the sea to the hills, is marshy.

In these marshes coco-nut trees are grown, and on the hills, timber trees, such as cedar, takamaka, &c. The hills consist mostly of red earth, which is very barren.

The presence of marshes accounts for the prevalence of mosquitoes, which abound in the lowlands. No anopheles have been discovered among these, however. There are two villages, one at Baie Ste. Anne, and one at Grand' Anse, both of which are served by a dispensary. That of Baie Ste. Anne, near which the medical officers' quarters are situated, is open to pauper patients three times a week. This year fifty-four patients obtained relief at Baie Ste. Anne dispensary. That of Grand' Anse is open to pauper patients once a week. It relieved ninety patients this year.

Gratuitous vaccination is performed at these dispensaries once a month. The two villages are not very well populated, however, the population being scattered all over the island.

The people are housed for the most part in leaf huts, the few wooden houses being Indian shops or belonging to the big landowners. The floor of the leaf huts consists generally of a coating of clean sea-sand, which is removed and renewed when required. They are thus kept in a fairly cleanly condition.

Excrement and house refuse disposal.—This is the most primitive possible, but on account of the thinness of the population, and in most cases the proximity of the houses to the sea, it does not seem to interfere with the health of the inhabitants. It may, however, account for the prevalence of helminthic disease.

The natural water supply of Praslin is excellent, and there are many streams of good water all over the island.

The number of births for 1909 was seventy-four, showing an increase of twenty-two over last year. This gives a birth-rate of 38.70 per 1,000. This is the highest birth-rate since the Census was taken in 1901. Of the seventy-four births for this year, forty-two were males and thirty-two females, showing an excess of ten male births. The children born in wedlock numbered forty-seven, and the illegitimate children twenty-seven.

The stillbirths: eight, an increase of six over last year.

The number of deaths which occurred in Praslin during 1909 was nineteen, a slightly smaller number than last year. This gives a death-rate of 9.93 per 1,000, which is, for the tropics, extremely low. For comparison with former years, the death-rate of Round Island is included in Praslin figures. This naturally raises the death-rate materially. If Round Island is included, the death-rate for this year would be 14.67 per 1,000, slightly higher than last year. Of the nineteen deaths, twelve were males and seven females, an excess of five male deaths.

Vital statistics.—The population has been estimated for the years since the Census was taken in 1901 by adding the excess of births over deaths, as shown by the civil status figures, and adding this to the population for the years before. This is a fairly accurate method, as the increase of the population is almost entirely natural, the artificial increase, or increase by immigration, being practically nil. The loss by emigration may also be disregarded.

Praslin Population by Census in 1901					...	=	1,621
,,	,,	Estimation on	Dec.	31,	1902	,,	1,653
,,	,,	,,	,,	,,	1903	,,	1,675
,,	,,	,,	,,	,,	1904	,,	1,724
,,	,,	,,	,,	,,	1905	,,	1,769
,,	,,	,,	,,	,,	1906	,,	1,803
,,	,,	,,	,,	,,	1907	,,	1,841
,,	,,	,,	,,	,,	1908	,,	1,866
,,	,,	,,	,,	,,	1909	,,	1,912

As the death-rate in Round Island is very high, and all the inhabitants of this island come from Mahé, the population of Praslin is slightly larger than is shown above.

Meteorological.—The south-east monsoon blows into Baie St. Anne and thus renders it cool, but during the north-west monsoon it is completely sheltered by hills and is very hot. A rain gauge and a record of rainfall has been kept at the police-station at Baie St. Anne since February, and a record of the daily maximum and minimum shade temperature at the assistant medical officer's quarters since August.

The rainfall at Praslin is less than at Mahé, but the temperature is higher.

The thermometers are not kept in Stevenson's screen, but in a room in the J.P.'s quarters. These quarters are tin-roofed and placed in a hollow, so that the temperature is much higher than it should be on the seashore, or if taken on the end of a pier, as in Mahé.

It may be taken, however, that the mean maximum temperature is higher at Praslin than at Mahé, and the mean minimum the same or slightly lower.

La Digue Island.

The island is 2,500 acres in extent. It is not so hilly as Praslin, and the hills do not consist of the same barren red earth. The soil is rich, and cocoa-nut-trees grow well almost all over the island.

On account of its fertility La Digue is much more densely populated than Praslin. There is a village at La Grande Passe, which is served by a dispensary which is open to the public once a week. The attendance at this dispensary is meagre, as there are very few paupers at La Digue. Gratuitous vaccination is performed once a month.

La Digue is not so healthy as Praslin, probably on account of the density of its population. The inhabitants also are richer, and are thereby enabled to indulge their appetite for alcohol more than their Praslin neighbours.

Venereal disease is rather common.

There are better houses in La Digue than in Praslin, the proportion of wooden iron-roofed houses being much higher. Shops are also proportionately more numerous.

The same primitive methods prevail with regard to excrement disposal as in Praslin, which probably has a worse effect on account of the greater density of the population, and doubtless accounts for the prevalence of ankylostomiasis and its consequent anæmia.

The natural water supply is good, there being several streams. La Digue, however, is not as well watered as Praslin.

There is a reservoir built near the village which feeds a public pump on the shore opposite the police-station. A water service is also laid on the "yards" of the houses, the occupants paying a quarterly rent for this privilege.

Vital Statistics.—The population has been estimated in the same way as Praslin=1,272.

Population by Census in 1901	...	...	...	...	=	1,074
,, Estimation on Dec. 31,			1902	...	,,	1,098
,,	,,	,,	,, 1903	...	,,	1,111
,,	,,	,,	,, 1904	...	,,	1,127
,,	,,	,,	,, 1905	...	,,	1,159
,,	,,	,,	,, 1906	...	,,	1,191
,,	,,	,,	,, 1907	...	,,	1,224
,,	,,	,,	,, 1908	...	,,	1,235
,,	,,	,,	,, 1909	...	,,	1,272

The number of births for 1909 was 55, an increase of 20 over 1908.

This gives a birth-rate of 43.23 per 1,000, an increase of 14.89 over 1908.

Of these 55 births, 28 were male and 27 female, an excess of 1 male birth.

There were 18 deaths during 1909, which gives a death-rate of 14.15 per 1,000. This is a lower rate than in 1908, where there were 24 deaths and a death-rate of 19.43. Of these 18 deaths, 10 were male and 8 female, an excess of 2 males.

The number of deaths which occurred under 5 years of age in 1909 was 9, which gives an infantile mortality of 7.07 per 1,000, over twice as high as that of Praslin.

Round Island.

The pauper camp and leper asylum are situated on Round Island.

It is a small island, situated in the mouth of Baie Ste. Anne, near the northern shore. It is well planted with coco-nuts.

Water supply.—There is, unfortunately, no stream or well on Round Island. There is a reservoir, however, for rain water which supplies water during the wet season. During the dry season water is carried daily from Baie St. Anne in barrels. When the weather is rough, water is obtained at a spring at Anse La Farine, which is much nearer than Baie St. Anne, but the water here is not so plentiful or good.

Leper Asylum.

The leper asylum is situated near the side of the island facing La Digue. It is placed on the seashore.

Various remedies have been tried for the disease, but none have shown any lasting success, partly owing perhaps to the unwillingness of the patients to submit to treatment. An amputation of the hand was performed on a leper in the early part of the year by Dr. M. S. Power, before my arrival. It must have been difficult to perform, owing to the absence of skilled assistance and the lack of a proper operating-room. It was perfectly successful, however, and gave the sufferer great relief. The inhabitants seem as contented as their condition permits, and amuse themselves by fishing and gardening. They all have been sent from Mahé at irregular intervals.

Pauper Camp.

The camp is situated on a plateau at the side of the island nearest the mainland—Praslin. It is sheltered by trees, but is kept cool by breezes which can reach it on account of its lofty position. The inhabitants are destitute negroes, for the most part old liberated African slaves sent from Mahé. A good many of them are suffering from some incurable disease.

On the whole they seem happy and contented. They are housed in the usual leaf huts with white sea-sand floors.

Both the pauper camp and the leper asylum are kept in a very cleanly condition, and the patients owe a great deal of their comfort to the care with which the overseer carries out the duties of his post.

Outlying Islands.

There are eight in number: Curieuse, Félicité, the Two Sisters, Marianne, Aride, Cousin, and Cousine.

The topography and general characteristics of them are all the same—hills in the centre, surrounded by a belt of marshland which extends almost to the seashore. They have nearly all one camp, generally situated at the part of the island which is nearest the safest landing-place. This camp is inhabited by the manager of the island, and the men who work under him with their wives and children.

On them all the staple industry is the growing of coco-nuts and their conversion into coprah, with vanilla growing.

No births, deaths, or marriages occurred on any of the islands during 1909.

A few details of each will be given below. They are all healthy.

Curieuse.—Area: 900 acres.

Population.—Males, 24; females, 12; children, 31. Total, 67.

Félicité.—Area: 800 acres.

Population.—Males, 19; females, 15; children, 5. Total, 39.

Marianne.—Area: 150 acres.

Population.—Males, 16; females, 6; children, 5. Total, 27.

Aride.—Area: 80 acres.

Population.—Males, 8; females, 3; children, 2. Total, 13.

The Two Sisters.—Big Sister.—Area: 250 acres approximately.

Population.—Males, 9; females, 5; children, 5. Total, 19.

Little Sister.—Area: about 50 acres.

Population.—Males, 2; females, 2; children, 1. Total, 5.

Cousin.—Area: 67 acres.

Population.—Males, 8; females, 3; children, 3. Total, 14.

Cousine.—Area: 52 acres.

Population.—Males, 3, females, 2. Total, 5.

Colonial Medical Reports.—No. 8.—Northern Nigeria.

MEDICAL REPORT FOR THE YEAR 1909.

By S. W. THOMPSTONE.

Principal Medical Officer.

As in former years, the vital statistics of the European resident population only are given, it being impossible in the absence of any system of registration of births and deaths of natives to include them.

The average number of Europeans resident in the Protectorate during the year—including both officials and non-officials, but excluding those engaged on the Northern Extension of the Lagos Railway—was 544, of whom 438 were officials and 106 non-officials, 527 males and 17 females.

The native population is estimated at approximately 7,000,000.

There were 13 deaths from all causes among the Europeans during the year—8 officials and 5 non-officials—one death which occurred on the Northern Extension of the Lagos Railway not being included. Of these, 9 died from disease, and 4 from accident.

The total crude European death-rate, calculated on the average resident population, and not corrected for age and sex, was 23.89—or excluding deaths from accidents 16.5. The rates from all causes amongst officials and non-officials being 15.9 and 56.6 respectively.

There were 67 Europeans invalided home during the year, 52 officials and 15 non-officials.

The total invaliding rate per thousand was 123.16—that for officials being 118.7 and for non-officials 141.5.

Europeans	Total	Deaths	Rate per 1,000
Total average resident population	544	13	23.89
Officials	438	*8	15.9
Non-officials	106	†5	56.6

* Three from accident. † One from accident.

Last year the average resident European population was 499, and the number of deaths 10—the crude death-rate being 20.04 per 1,000. There has been an increase in European population over last year of 45, and in the death-rate from all causes of 3.85, this increase in the death-rate being accounted for entirely by the comparatively large number of deaths from accident—the death-rate from disease only showing a decrease of 1.5 per 1,000. The invaliding rate, however, was higher by 26.97 per 1,000.

The figures dealt with are not sufficiently large to make the comparison of one year with another of much value. Taking the statistics of the six previous years (1903-8) as a basis, the death-rate from all causes in the year under review was below the average by 9.54 per 1,000, and the invaliding rate by 15.9 per 1,000, the average rates being 33, 43 and 139 per 1,000 for these years.

The most unhealthy months for Europeans were August, June and January, the number of admissions having been 133, 131 and 130 in these months, as against 88 in July and 101 in December. On the whole there has been no such marked difference in the amount of sickness in the different months as has occurred in former years.

The general character of the diseases prevailing showed little change. The case mortality of blackwater fever was lower by 5.57 per cent. than last year, and higher by .7 per cent, than the average of the last six years, but the number of cases was less in proportion to the population than in any former year, the actual number of admissions being 13 with 3 deaths.

There was no great difference in the relative mortality among Europeans in the different seasons. Two deaths occurred in October, but otherwise they were distributed throughout the year.

Amongst the natives the death-rate, so far as can be gathered from the returns of those treated, was much the same throughout the various months. There were no serious epidemics, and the general health was good.

Zungeru.

The rainfall during the year was 58.89 in., or 10.11 in. more than in 1908, and only 1.5 in. less than the highest on record, which was 60.39 in 1906. The wettest month was September with 14.27 in. Rain fell in every month except February and November, the heaviest fall recorded being 2.48 on July 28. The mean temperature for the year was 81° F. The maximum shade temperature was 103° F. in March, and the minimum 56° F. in November. The highest mean temperature was 87° F. in March, and the lowest 77° F. in August. The mean relative humidity for the year was 70—the highest mean being 89 in July and August, and the lowest 44 in January—calculated from readings taken at 9 a.m.

Colonial Medical Reports.—No. 8.—Northern Nigeria— *(continued).*

LOKOJA.

The total rainfall was 65.14 in., 21.02 in. more than last year, the wettest month being August with 12.13 in. The maximum shade temperature was 102° F., which was recorded in March, and the minimum 58° F. in January. The highest mean temperature was 86° F. in March, and the lowest 78.5 in July, the mean for the year being 82° F.

The highest shade temperature recorded in the Protectorate during the year was 112° F. at Maiduguri in March, and the lowest 35° F. at Bautshi in June. The highest mean temperature for the year was at Baro—84° F.—and the lowest at Ankpa in the Bassa province, 77° F.

The greatest annual rainfall was that recorded at Ankpa—66.85 in., and the greatest fall in one day, 4.77 in., at Lokoja on March 25.

Bautshi showed the greatest range of temperature —70° F.—from 105° in March to 35° in June.

The general direction of the wind throughout the Protectorate was from the South-west during the rainy season, and from the North-east during the rest of the year—the Harmattan lasting generally from November until May.

With regard to the probable effect of the meteorological conditions on the health of the community, the unusually prolonged and heavy wet season increased the number of cases of malaria and diseases of the respiratory system, both among Europeans and natives, and changed the usual distribution of sickness throughout the year by tending to equalize the various months, there having been no such well-marked difference in the sick-rate according to the time of the year as has obtained usually in the past.

Malaria.—This disease, as in former years, still accounts for the greatest number of cases of illness in the Protectorate. The total number of admissions among Europeans during the year was 443, an increase over last year of 136, the population having increased from 499 to 544—a relative increase. Blackwater fever has been classified separately for the sake of convenience. The type of disease was in most cases mild, and there were no deaths.

Dysentery.—There were 31 cases among Europeans during the year, with no deaths, all being of a mild type.

Cerebro-spinal fever.—The epidemic which caused such an enormous number of deaths in 1905 seems to have subsided for the time being, two cases only having been reported—both among natives.

Sleeping sickness.—Seven cases were met with during the year throughout the Protectorate, 5 in Bautshi, 1 in Katsena Allah, and 1 in Sokoto. A considerable amount of investigation has been carried on with reference to the past history and present distribution of this disease in Northern Nigeria. Maps were sent out early in the year to all medical officers, with instructions to fill in the distribution of the varieties of tsetse-fly met with in their districts, specifying the exact localities in which they were found. From these maps a general fly map of the Protectorate is being compiled. So far as the returns show up to now, it would appear that *Glossina palpalis* is found throughout the whole country, wherever there are rivers or streams with wooded banks.

From the reports from the various provinces, sleeping sickness—though only sporadic cases are now found—was responsible in the past for many deaths, and, although native evidence as to the nature of epidemics is not always reliable, there is no doubt that the disease has existed for years in Kabba, Bassa, Bautshi, Katagum, and Sokoto, The policy pursued has been to remove cases when recognized to parts of the country which have been found to be free from fly. The natives themselves send all sufferers out of the towns into the bush. Clearing measures can evidently only be carried out to a very limited extent in a country the size of this, but in Zungeru, Baro, and Lokoja, where it was possible to deal with the question in this way, the clearing of the undergrowth and thinning the larger trees has had most gratifying results in diminishing the number of tsetse-flies found. A report on a tour in Kabba made by Dr. C. E. S. Watson with a view to finding if any endemic foci of the disease existed in that province has been already sent in.

Beri-beri.—There were no fresh cases during the year. Of the two remaining from the previous year one died and the other recovered.

Syphilis.—437 cases were under treatment—a considerable reduction from previous years—there having been 549 cases treated last year, and 774 the year before.

Yaws.—102 cases were admitted as against 114 in 1908.

Small-pox.—There was an epidemic of this disease at Lokoja—56 cases, with no deaths.

The European stations are generally in as good a sanitary condition as circumstances will allow, financial considerations alone in most cases being responsible for deficiencies in this respect. Improvements are being effected from year to year, better quarters are being provided, and as railway communication is being established, much ill-health now caused by the hardships and risks of travel will be avoided. As the country is opened up medical

Return of Diseases and Deaths in 1909 amongst Europeans and Natives in the Northern Nigeria Protectorate.

GENERAL DISEASES.

	Europeans		Natives		
	Admissions	Deaths	Admissions	Deaths	Total Cases Treated*
Alcoholism	—	—	—	—	—
Anæmia	47	—	96	5	143
Anthrax	—	—	—	—	—
Beri-beri	—	—	2	1	2
Bilharziosis	—	—	—	—	—
Blackwater Fever	13	3	2	—	13
Chicken pox	—	—	6	—	6
Cholera	—	—	—	—	—
Choleraic Diarrhœa	—	—	—	—	—
Congenital Malformation	—	—	—	—	—
Debility	11	—	66	7	77
Delirium Tremens	—	—	—	—	—
Dengue	—	—	—	—	—
Diabetes Mellitus	—	—	—	—	—
Diabetes Insipidus	—	—	—	—	—
Diphtheria	1	1	—	—	1
Dysentery	31	—	678	54	718
Enteric Fever	2	1	—	—	3
Erysipelas	1	—	—	—	1
Febricula	—	—	—	—	—
Filariasis	—	—	—	—	—
Gonorrhœa	1	—	1713	—	1757
Gout	3	—	—	—	3
Hydrophobia	—	—	—	—	—
Influenza	8	—	28	—	36
Kala-Azar	—	—	—	—	—
Leprosy	—	—	22	—	23
(*a*) Nodular	—	—	—	—	—
(*b*) Anæsthetic	—	—	—	—	—
(*c*) Mixed	—	—	—	—	—
Malarial Fever	443	448	1715	9	2160
(*a*) Intermittent	—	—	—	—	—
Quotidian	—	—	—	—	—
Tertian	—	—	—	—	—
Quartan	—	—	—	—	—
Irregular	—	—	—	—	—
Type undiagnosed	—	—	—	—	—
(*b*) Remittent	—	—	—	—	—
(*c*) Pernicious	—	—	—	—	—
(*d*) Malarial Cachexia	—	—	—		—
Malta Fever	—	—	—	—	—
Measles	28	—	—	—	28
Mumps	—	—	—	—	—
New Growths—	—	—	7	—	7
Non-malignant	1	—	7	—	8
Malignant	2	—	2	—	4
Old Age	—	—	—	—	—
Other Diseases	33	—	263	40	301
Pellagra	—	—	—	—	—
Plague	—	—	—	—	—
Pyæmia	—	—	2	2	2
Rachitis	—	—	—	—	—
Rheumatic Fever	8	—	676	2	684
Rheumatism	—	—	—	—	—
Rheumatoid Arthritis	—	—	—	—	—
Scarlet Fever	—	—	—	—	—
Scurvy	—	—	—	—	—
Septicæmia	—	—	3	3	3
Sleeping Sickness	—	—	7	—	7
Sloughing Phagedæna	—	—	—	—	—
Small-pox	—	—	80	5	80
Syphilis	1	—	437	1	438
(*a*) Primary	—	—	—	—	—
(*b*) Secondary	—	—	—	—	—
(*c*) Tertiary	—	—	—	—	—
(*d*) Congenital	—	—	—	—	—
Tetanus	—	—	1	1	1
Trypanosoma Fever	—	—	—	—	—
Tubercle—	—	—	—	—	—
(*a*) Phthisis Pulmonalis	—	—	5	1	5
(*b*) Tuberculosis of Glands	—	—	—	—	—
(*c*) Lupus	—	—	—	—	—
(*d*) Tabes Mesenterica	—	—	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—	—	—
Other Tubercular Diseases	—	—	—	—	—
Varicella	—	—	—	—	—
Whooping Cough	—	—	—	—	—
Yaws	—	—	102	—	104
Yellow Fever	—	—	—	—	—

LOCAL DISEASES.

	Europeans		Natives		
	Admissions	Deaths	Admissions	Deaths	Total Cases Treated*
Diseases of the—					
Cellular Tissue	25	—	798	2	827
Circulatory System—	—	—	—	—	—
(*a*) Valvular Disease of Heart	2	1	10	3	13
(*b*) Other Diseases	11	—	37	7	49
Digestive System—	—	—	—	—	—
(*a*) Diarrhœa	46	—	757	10	809
(*b*) Hill Diarrhœa	—	—	—	—	—
(*c*) Hepatitis	9	1	11	3	21
Congestion of Liver	18	—	7	—	26
(*d*) Abscess of Liver	1	—	—	—	1
(*e*) Tropical Liver	—	—	—	—	—
(*f*) Jaundice, Catarrhal	1	—	8	—	9
(*g*) Cirrhosis of Liver	—	—	—	—	—
(*h*) Acute Yellow Atrophy	—	—	—	—	—
(*i*) Sprue	—	—	—	—	—
(*j*) Other Diseases	220	1	2025	13	2250
Ear	18	—	142	—	165
Eye	20	—	683	—	713
Generative System—	—	—	—	—	—
Male Organs	—	—	—	—	—
Female Organs	—	—	—	—	—
Lymphatic System	24	—	189	1	215
Mental Diseases	—	—	—	—	—
Nervous System	24	1	223	3	251
Nose	13	—	40	—	56
Organs of Locomotion	24	—	794	—	822
Respiratory System	51	—	1202	9	1209
Skin—	—	—	—	—	—
(*a*) Scabies	1	—	14	—	15
(*b*) Ringworm	13	—	81	—	94
(*c*) Tinea imbricata	—	—	2	—	2
(*d*) Favus	—	—	1	—	1
(*e*) Eczema	8	—	65	—	76
(*f*) Other Diseases	86	—	4172	11	4245
Urinary System	16	—	230	6	250
Injuries, General, Local—	—	—	—	—	—
(*a*) Siriasis (Heatstroke)	3	—	87	7	90
(*b*) Sunstroke (Heat Prostration)	—	—	—	—	—
(*c*) Other Injuries	129	11	5228	11	5601
Parasites—	—	—	—	—	—
Ascaris lumbricoides	—	—	—	—	—
Oxyuris vermicularis	—	—	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	—	—	8	2	8
Filaria medinensis (Guinea-worm)	—	—	—	—	—
Tapeworm	—	—	—	—	—
Poisons—	—	—	—	—	—
Snake-bites	—	—	27	1	27
Corrosive Acids	—	—	—	—	—
Metallic Poisons	—	—	—	—	—
Vegetable Alkaloids	—	—	—	—	—
Nature Unknown	—	—	—	—	—
Other Poisons	9	2	53	—	61
Surgical Operations—	—	—	—	—	—
Amputations, Major	—	—	—	—	—
,, Minor	1	—	2	—	3
Other Operations	—	—	—	—	—
Eye	—	—	—	—	—
(*a*) Cataract	—	—	—	—	—
(*b*) Iridectomy	—	—	—	—	—
(*c*) Other Eye Operations	—	—	—	—	—

* These include the cases remaining in hospital at the end of the previous year.

officers are visiting the various native towns and villages in their districts with a view to investigating the incidence and nature of diseases met with, and advising the local head-men as to the best measures of effecting improvements in sanitation. One very common cause of the spread of water-borne disease in native towns, where wells are used as a source of supply of drinking water, is the depression of the ground round the well mouth, and consequent pollution of the water supply by surface drainage. It is caused by the constant traffic to and from the well and the weight on the unprotected edge when water is being drawn. This is a condition which can be, and is, easily remedied when discovered, but is mentioned here as an example of the obvious good which may be effected by systematic tours of inspection, and the inculcation of the elementary rules of hygiene.

Zungeru.

The average resident European population during the year was 67.4—63.4 officials, and 4 non-officials. The general health has been good; the number of Europeans admitted to hospital, including cases sent in from out-stations, was 79, with one death, which occurred from hepatic abscess in the month of August. The sanitary condition of the cantonment is satisfactory, the drainage being effective and the water supply good. The condensing plant used for distilling the water of the Dago for drinking purposes has given a sufficient and excellent supply.

Extensive clearing has been done during the year on the banks of the Dago where it runs through the cantonment, with a view to abolishing the habitat of the tsetse-fly. All the undergrowth was cut down, the larger timber thinned out, and the lower branches of such trees as were left cut out. So far the results have been satisfactory, and no specimens of the fly have been found for some months.

The native town, the houses in which were too close together, has been opened up by a 50 ft. road which has been driven through the middle of the most congested portion, and new building plots granted to the inhabitants of the houses which were pulled down, on an extension of this road to the south. This has effected a considerable improvement, and will make any further outbreak of infectious disease much easier to deal with, and less liable to spread.

Small incinerators for destroying refuse are in process of construction, the system at present in use of burning in open fires being unsatisfactory in the rainy season, and difficult to carry out. The conservancy is on the dry earth system, the contents of the pails being buried in pits at some distance from the station.

Native Hospital.—This has been removed from its former site and has now been established in the buildings formerly used as a Freed Slaves' Home. The change has proved a success, both from a point of view of accommodation and convenience. The number of admissions has increased from 740 last year to 1,340 in 1909. 2,048 out-patients were treated during the year.

Gaol.—The premises were kept clean and in excellent order, the diet has been good and sufficient, and the ventilation of the cells is adequate for the number of prisoners for which the gaol was intended to hold. There has been, however, a considerable amount of overcrowding during the year; this condition of affairs was slightly improved towards the end of the year, but the space available is still insufficient for the number of prisoners kept there. In the dry season the water supply is obtained from the Dago River, and the water used for drinking is boiled before use. For the wet season extra rain water tanks have been provided, which should collect sufficient drinking water to render the gaol independent of the river supply. The average number of prisoners during the year was 287.

Freed Slaves' Home.—The compound and dormitories were kept clean, the water supply was good and sufficient, and the food excellent. The Home was removed during the year to Rumasha. The health of the inmates was satisfactory during the time they were in Zungeru, and their general physical condition when they left was very good.

Lokoja.

The average resident European population during the year was 96.8—68 officials and 28.8 non-officials. The general health was good. The number of Europeans admitted to hospital—including cases sent in from out-stations—was 124; there were no deaths. Last year there were 112 admissions with one death, and the year before 122 with two deaths.

The sanitary condition of the cantonment is good, but considerable difficulty has been found in keeping the main earth drains clear of weeds, and their banks of undergrowth. Undoubtedly the best solution of the problem when funds are available will be to cement them, but the cost is prohibitive at present. All the trench latrines formerly used have been done away with, and a pan system introduced in their place. Empty barrels have been supplied to natives for kitchen and other refuse, which are removed daily and the contents burnt.

Native Hospital.—A new wing has been added to provide for the increase in the number of persons seeking treatment. There were 918 admissions during the year, an increase of 69 over last year,

and 2,290 out-patients were treated there, as against 1,138 in 1908.

Gaol.—The premises were kept clean and in good sanitary condition, the diet was ample and of good quality, and the supply of drinking water good and sufficient. The ventilation of the cells is quite adequate for the number of prisoners for which they were designed, but here also considerable overcrowding has occurred during the year. The accommodation is being increased, and will require to be almost doubled.

KANO.

The average European population was 25.8—24.2 officials, and 1.6 non-officials. There were 143 patients treated during the year and there was one death—from accident. The general health has been fairly good and has much improved of late.

The water supply is obtained from one large and several smaller springs. The main spring is walled in, and roofed. The water is distilled for drinking purposes.

Refuse is burnt and carried away to outlying farms. The pail and dry earth system is in use. The sanitary condition of the station is good; mosquitoes—chiefly Culex—abound during the rains, but everything possible is being done to do away with their breeding places. Mosquito proof rooms are being provided for all Europeans, and the station is being drained as well as the nature of the site will allow.

Baro-Kano Railway.—The average number of Europeans employed on the railway throughout the year was 140, there was one death, and 21 were invalided as against two deaths and 9 invalided out of an average population of 120 last year. The death-rate was considerably lower than the general death-rate of the Protectorate.

A European hospital with a staff of nurses has been opened on Baro Hill during the year for the admission of cases coming down the line, and a well-equipped native hospital has been established.

The sanitary condition of Baro has been much improved. *Glossina palpalis* was found in fair numbers on the high ground, and clearing operations were undertaken on a somewhat extensive scale, with very good results in diminishing their number. The swamp at the foot of the hills has been drained, and all pools which it was found impossible to deal with otherwise were systematically treated with kerosene. Mosquito-proof rooms have been supplied to the permanent houses in Baro, and to the various camps up the line, and the borrow pits drained where possible.

There were 2,662 successful vaccinations performed during the year. All Government employees, native soldiers, and police who have not had small-pox are vaccinated as far as possible, and increasing numbers of the inhabitants of the native towns. The total number of vaccinations performed is less than last year; this is accounted for by the smaller numbers returned from the Baro-Kano Railway, and from Bautshi, where a somewhat extensive outbreak of small-pox in 1908 caused a very large temporary increase in the numbers of natives who came in for vaccination. The powdered lymph now used has proved much more effective than the tubes of ordinary lymph formerly supplied, and considerable success has been obtained in the more northern provinces where all previous attempts had failed. Inoculation is widely practised in most parts of the country in times of epidemic by the natives themselves.

There were 1,384 cases of Europeans on the sick list from all causes during the year throughout the Protectorate, including both intern and extern patients. This is an increase over last year of 418, but is largely due to the inclusion of many trifling ailments which were formerly not returned.

There was a large increase in the number of natives under treatment at the various Government hospitals and dispensaries, the total being 22,847 (not including 3,271 cases of minor injuries treated on the railway). Last year the number was 18,032.

There were 3,467 pauper patients treated during the year, a return of whom is attached, showing the numbers at the different stations.

One case of diphtheria—the first recorded in Northern Nigeria—occurred in a European at Sokoto; death occurred on the sixth day of the disease, and a *post-mortem* examination showed a typical diphtheric membrane extending throughout the bronchi.

There were also four cases of German measles in Europeans.

Colonial Medical Reports.—No. 9.—Ceylon.

MEDICAL REPORT FOR THE YEAR 1909.

By Sir ALLAN PERRY, Kt., M.D., D.P.H.

Principal Civil Medical Officer and Inspector-General of Hospitals.

SECTION I.—POPULATION: BIRTH- AND DEATH-RATES.

The estimated population of the Island on December 31, 1909 (exclusive of the military and shipping population), was 4,082,935. The births registered were 148,891, and the deaths 122,970. The birth-rate was 36.7 per mille, calculated on the estimated population in the middle of the year, and the death-rate was 30.3 per mille, as against 40.1 and 29.4 per mille, respectively, in the previous year.

SECTION II.—PUBLIC HEALTH.

Vital Statistics.

The public health during the year showed some improvement over the previous year. The amount of malarial fever was less, and the type of this disease was under enteric fever. Small-pox and cholera showed a great decline. Anchylostomiasis, dysentery, leprosy, parangi, and phthisis were in excess of the numbers noted in 1908. The healthiest Province was the Western, and the unhealthiest the Uva and North-Central Provinces. The lowest death-rate occurred in the Negombo and Chilaw Districts, and the highest death-rate in Batticaloa, Ratnapura, and Kurunegala.

Under the headings cerebro-spinal fever, simple continued fever, enteric fever, influenza, remittent fever, and ague, according to the Registrar-General's returns, there were 23,903 deaths. Under the headings diarrhœa, dysentery, dyspepsia, enteritis, obstruction of the bowel, hernia, and appendicitis, there were 22,932 deaths, 410 of which were returned under the head of enteritis, some of which in all probability were deaths due to enteric fever. It is interesting to note that there were 11 deaths only from appendicitis. There were 9,453 deaths from respiratory diseases, which included laryngitis, croup, bronchitis, asthma, pneumonia, pleurisy, and other undefined respiratory diseases (not including phthisis).

There were 4,195 deaths from phthisis. Under the head of diseases of the nervous system 14,477 deaths were registered; 488 of these were due to tetanus. There were 755 deaths from diseases of the circulatory system, 1,486 from anchylostomiasis, 182 from diabetes mellitus, 158 from "cancer," 94 from parangi (yaws), 73 from leprosy, 20 from hydrophobia, 8 from cholera, 204 due to suicide, and 189 due to snake-bite.

Deaths due to Preventible Disease.—Of the 122,970 deaths registered, 17,734 were due to what may be called preventible diseases, or at least diseases that can be controlled by man, and among these I include enteric fever (9,665 deaths), phthisis (4,195 deaths), anchylostomiasis (1,486 deaths), puerperal fever (771 deaths), malaria (852 deaths), tetanus (488 deaths), parangi (94 deaths), leprosy (73 deaths), small-pox (82 deaths), hydrophobia (20 deaths), and cholera (8 deaths). In Colombo enteric fever is controlled by notification, disinfection, and segregation on the part of the Health Department of the Municipality. In other places the control is not so good. There is practically no control over phthisis, but it is hoped that this disease will be lessened after the recommendations of the Tuberculosis Commission now sitting are put in force. There is no control exercised at present over anchylostomiasis, puerperal fever, parangi, tetanus, and hydrophobia. Something has been done with regard to the reduction of malaria, but not sufficient; leprosy is more under control; and the figures for small-pox and cholera are encouraging as pointing to energetic vaccination and hygienic measures.

With regard to hydrophobia, I consider 20 deaths from that disease in a year high, although it works out only about 5 per million of the population. There is no record of how many persons were bitten by animals suffering from suspected rabies. The following towns returned deaths from this disease: Chilaw 5, Kalutara 4, Kandy 3, Kegalla 2, Negombo 2, Kurunegala 2, Galle 1, Colombo 1. Seven dogs were found to be rabid within Colombo Municipal limits. The above facts would suggest the propriety of applying the Rabies Ordinance energetically as regards the destruction of stray dogs and the muzzling of others.

A great benefit has been rendered to Ceylon by the establishment of a Pasteur Institute at Coonoor in the Nilgiris, to which a fair number of Ceylon people bitten by dogs have gone for treatment.

Infantile Mortality.—The infant mortality in the thirty-one principal towns was equal to a rate of 257.7 per 1,000 births registered.

The Health on Estates.—The mean birth-rate on estates for the four quarters of the year was 36.6 per 1,000 and the death-rate 39.6 per 1,000, as against 34.5 and 36.2 respectively for 1908. The estate population, according to the Census of 1901, was 420,340. The principal causes of deaths were dysentery 2,940, diarrhœa 2,927, debility 2,058, pneumonia 1,517, anchylostomiasis 1,103, convulsions 1,000, fevers 556, phthisis 188.

Total Deaths in the Island.—The total number of deaths registered in the Island was 122,970. The largest number of deaths occurred in the first quarter of the year, followed by the third and fourth quarters. In the second quarter the fewest number was registered.

Principal Diseases.

Malaria.—The total number of persons treated for this disease in hospitals and dispensaries during the year was 512,855, against 513,799 in 1908. 11,117 patients suffering from this disease were admitted to hospital, of whom 612 died. There were 1,050 cases with 10 deaths in the jails. The total amount of quinine issued from the Civil Medical Stores was 76,679 oz., which cost Rs. 42,273.45.

Cholera.—There were 12 cases of cholera with 7 deaths, as against 51 with 40 deaths in 1908. Of these 12 cases, 3 occurred in the Ragama quarantine camp with 1 death—all among immigrants from South India; 9 cases occurred at Kattakadu in the North-Western Province, with 6 deaths. The source of infection was not discovered. All the other Provinces were free from outbreaks of cholera throughout the year. Although the Registrar-General shows 8 deaths from this disease, there were 7 only in Government institutions.

Small-pox.—280 cases of small-pox were treated by the officers of this Department, with 62 deaths, as against 1,446 cases with 321 deaths in the previous year. 244 of these cases with 55 deaths occurred in the Western Province, mostly in Colombo; 119 were treated in the infectious diseases hospital, with 46 deaths. It is a significant fact that these 46 deaths were in unvaccinated persons. In the Central Province there were 24 cases with 6 deaths, in the Southern Province there were 9 cases with no death, and in the Eastern Province there were 3 cases with 1 death.

Enteric Fever.—657 cases of this disease were treated in the seventy-three hospitals of the Colony (excluding the jail hospitals), as compared with 1,029 during the previous year. Of these 657 cases, 429, or over 63 per cent., were treated in the Civil Hospital at Colombo and the Lady Havelock and Police Hospitals, Colombo, with a total mortality of 113. The incidence of enteric in the larger towns, as indicated by the hospital returns, shows that Kandy had 74 cases with 15 deaths, Galle 26 cases with 10 deaths, Nawalapitiya 15 cases with 5 deaths, Kurunegala 13 cases with 5 deaths, Anuradhapura 10 cases with 8 deaths, Kalutara 9 cases with 1 death, Matara 7 cases with 1 death, Matale 7 cases with 1 death, Nuwara Eliya 6 cases with 1 death. The returns from the hospitals in the planting districts and rural hospitals show a small incidence of enteric fever, Dikoya heading the list with 6 cases and 1 death. Compulsory notification of this disease is difficult in the rural districts. It is carried out in the Municipal and some other towns, but many cases are never diagnosed or reported. In the eighteen hospitals attached to the jails there were 4 cases with 2 deaths, as against 12 cases and 2 deaths in 1908.

Dysentery.—During the year 3,273 cases of this disease were treated in the Ceylon hospitals with a mortality of 31.26 per cent., compared with 3,099 with a mortality of 26.38 in 1908. The disease prevailed in all the Provinces: 837 cases were treated in the Colombo hospitals, 172 in Kandy, 132 in Matale, 113 in Badulla, 111 in Ratnapura, 106 in Avisawella, 70 in Kurunegala, 45 in Galle, 60 in Jaffna, 39 in Nuwara Eliya. In the jails there were 827 cases with 59 deaths, a death-rate of 7.13. In the jails in the Colombo District 318 cases occurred with a mortality of 27, as compared with 312 cases with 33 deaths in 1908.

Chicken-pox.—In the year under review 2,936 cases of this disease with 3 deaths occurred, as against 3,471 with 1 death in the year previous.

Leprosy.—607 cases of leprosy were treated in Government medical institutions during the year. Of these, 533 were treated in the Leper Asylum at Hendala, at which institution there were 47 deaths; 35 cases, with 7 deaths, were treated at the Leper Asylum, Kalmunai. The remaining 39 cases were treated temporarily in the various medical institutions in different parts of the Island. Plans and estimates are under consideration for a leper colony near Batticaloa. The Leper Asylum at Hendala is now provided with accommodation for police, who have been stationed there since the assault on the Medical Superintendent at the end of 1908. This measure was considered necessary in view of the tendency to insubordination among some of the lepers. Owing to the difficulties attending diagnosis in the less pronounced cases, it is not possible to give definite figures of the exact number of lepers scattered over the Island, but registers are kept by all Provincial Surgeons of all known and suspected cases of leprosy for whom there is not asylum accommodation at present.

The second International Conference on Leprosy confirms in every respect the resolutions adopted by the First International Conference of Berlin, 1897.

Resolutions Passed at the Second International Conference.

(i) Leprosy is a disease which is contagious from person to person, whatever may be the method by which this contagion is effected.

(ii) Every country in whatever latitude it is situated is within the range of possible infection by leprosy, and may, therefore, usefully undertake measures to protect itself.

(iii) In view of the success obtained in Germany, Iceland, Norway, and Sweden, it is desirable that other countries with leprosy should proceed to isolate their lepers.

(iv) It is desirable that lepers should not be permitted to follow certain occupations which are particularly dangerous in respect to the contagion of leprosy.

(v) In every country and in all cases the strict isolation of leprous beggars and vagrants is necessary.

(vi) It is desirable that the healthy children of lepers should be separated from their leprous parents as soon as possible, and that these children should remain under observation.

(vii) An examination by a competent physician should be made from time to time of those who have lived with lepers.

(viii) All theories on the ætiology and the mode of

RETURN OF DISEASES AND DEATHS IN 1909 AT THE FOLLOWING INSTITUTIONS:—

Lunatic Asylum, Leper Asylum and Hospital, De Soysa Lying-in Home, Lady Havelock Hospital, General Hospital, Clinic for Tropical Diseases, Victoria Memorial Eye Hospital, Pauper Hospital, 30 Civil Hospitals, 21 District Hospitals, Immigrant, Field, Infectious Diseases, Female and Police Hospitals, Ceylon.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	76	3	77
Anæmia	328	50	347
Anthrax	—	—	—
Beri-beri	10	1	11
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	708	2	720
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	3060	574	3198
Delirium Tremens	3	—	3
Dengue	—	—	—
Diabetes Mellitus	80	9	84
Diabetes Insipidus	4	1	6
Diphtheria	3	2	3
Dysentery	3080	1014	3224
Enteric Fever	589	178	656
Erysipelas	83	24	92
Febricula	30	1	32
Filariasis	—	—	—
Gonorrhœa	1179	9	1223
Gout	—	—	—
Hydrophobia	1	1	2
Influenza	315	—	322
Kala-Azar	—	—	—
Leprosy	—	—	—
(*a*) Nodular	70	20	153
(*b*) Anæsthetic	99	14	236
(*c*) Mixed	84	22	218
Malarial Fever—	—	—	—
(*a*) Intermittent	—	—	—
Quotidian	1804	36	1862
Tertian	2118	43	2200
Quartan	2031	12	2071
Irregular	405	11	414
Type undiagnosed	318	2	331
(*b*) Remittent	407	27	424
(*c*) Pernicious	1	1	1
(*d*) Malarial Cachexia	3599	479	3802
Malta Fever	—	—	—
Measles	143	1	147
Mumps	36	—	36
New Growths—	—	—	—
Non-malignant	225	19	236
Malignant	137	20	150
Old Age	186	53	198
Other Diseases	250	28	253
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	26	12	27
Rachitis	—	—	—
Rheumatic Fever	9	1	12
Rheumatism	1972	34	2040
Rheumatoid Arthritis	—	—	—
Scarlet Fever	6	—	6
Scurvy	1	—	1
Septicæmia	79	29	83
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	163	46	209
Syphilis	—	—	—
(*a*) Primary	1308	4	1389
(*b*) Secondary	860	2	894
(*c*) Tertiary	322	21	339
(*d*) Congenital	68	10	70
Tetanus	85	42	85
Trypanosoma Fever	—	—	—
Tubercle—	4	—	4
(*a*) Phthisis Pulmonalis	1765	585	1833
(*b*) Tuberculosis of Glands	69	4	73
(*c*) Lupus	13	—	15
GENERAL DISEASES—*continued.*			
(*d*) Tabes Mesenterica	10	5	11
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	9	—	9
Yaws	3344	18	3485
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	2195	116	2281
Circulatory System	—	—	—
(*a*) Valvular Disease of Heart	278	58	289
(*b*) Other Diseases	120	22	124
Digestive System—	—	—	—
(*a*) Diarrhœa	3984	1893	4132
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	199	15	206
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	88	27	91
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	55	10	57
(*g*) Cirrhosis of Liver	222	86	229
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	2318	203	2375
Ear	111	2	113
Eye	1056	24	1114
Generative System—	—	—	—
Male Organs	1010	11	1042
Female Organs	2503	75	2658
Lymphatic System	926	16	966
Mental Diseases	411	60	989
Nervous System	894	154	940
Nose	45	3	45
Organs of Locomotion	409	8	434
Respiratory System	4096	916	4241
Skin—	—	—	—
(*a*) Scabies	872	5	897
(*b*) Ringworm	26	—	27
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	546	1	558
(*f*) Other Diseases	7704	183	8114
Urinary System	809	151	847
Injuries, General, Local—	5573	163	5756
(*a*) Siriasis (Heatstroke)	2	1	2
(*b*) Sunstroke (Heat Prostration)	10	2	10
(*c*) Other Injuries	595	107	633
Parasites—	3	0	3
Ascaris lumbricoides	522	55	548
Oxyuris vermicularis	5	—	5
Dochmius duodenalis, or Ankylostoma duodenale	4506	1184	1875
Filaria medinensis (Guinea-worm)	29	1	31
Tape-worm	5	—	5
Poisons—	—	—	—
Snake-bites	8	2	8
Corrosive Acids	6	—	6
Metallic Poisons	15	4	15
Vegetable Alkaloids	39	5	39
Nature Unknown	—	—	—
Other Poisons	69	7	69
Surgical Operations—	—	—	—
Amputations, Major	52	10	56
,, Minor	60	—	61
Other Operations	3288	89	3355
Eye	—	—	—
(*a*) Cataract	6	—	7
(*b*) Iridectomy	2	—	2
(*c*) Other Eye Operations	6	—	6

propagation of leprosy should be carefully examined to ascertain if they accord with our knowledge of the nature and the biology of the bacillus of leprosy.

(ix) It is desirable that the question of the transmissibility of leprosy by insects should be elucidated, and that the possibility of the existence of leproid diseases among animals (rats) should receive early study.

(x) The clinical study of leprosy induces the belief that it is not incurable. We do not at present possess a certain remedy. It is desirable, therefore, to continue the search for a special remedy.

For the purpose of comparison the following are the resolutions passed at the First International Conference on Leprosy at Berlin, 1897 :—

(*a*) In all countries in which leprosy occurs in foci, or is widely distributed, isolation is the best means of preventing the spread of the disease.

(*b*) The system of compulsory notification, supervision, and isolation, as carried out in Norway, should be recommended to all nations possessing local self-government and an adequate number of physicians.

(*c*) It must be left to the legally-constituted authorities, after consultation with the sanitary authorities, to determine the special regulations which must be adapted to the special social conditions (of each country).

The following additional resolutions were unanimously approved by the eight British delegates who attended the Conference, and are to be taken in conjunction with the official recommendations passed at the Conference :—

"We, the undersigned delegates from the British and certain Colonial Governments, unanimously approve the resolutions adopted at the Second International Scientific Congress on Leprosy, held at Bergen, August 16-19, 1909. At a special meeting held by us on August 20, 1909, we agreed to the following additional resolutions :—

"(*a*) Leprosy is spread by direct and indirect contagion from persons suffering from the disease. The possibility that indirect contagion may be effected by fleas, bugs, lice, the itch parasite, &c., has to be borne in mind. Leprosy is most prevalent under conditions of personal and domestic uncleanliness and overcrowding, especially where there is close and protracted association between the leprous and non-leprous.

"(*b*) Leprosy is not due to the eating of any particular food, such as fish.

"(*c*) There is no evidence that leprosy is hereditary; the occurrence of several cases in a single family is due to contagion.

"(*d*) In leprosy an interval of years may elapse between infection and the first recognized appearance of disease. It is a disease of long duration, though some of its symptoms may be quiescent for a considerable period and then recur.

"(*e*) The danger of infection from leprous persons is greater when there is discharge from mucous membranes or from ulcerated surfaces.

"(*f*) Compulsory notification of every case of leprosy should be enforced.

"(*g*) The most important administrative measure is to separate the leprous from the non-leprous by segregation in settlements or asylums.

"(*h*) In settlements home life may be permitted under regulation by the responsible authorities.

"(*i*) The preceding recommendations, if carried out, will provide the most efficient means of mitigating the leper's suffering and of assisting in his recovery, and at the same time will produce a reduction and ultimate extinction of the disease."

Anchylostomiasis.—4,896 cases with 1,184 deaths were treated in the different hospitals of the Colony during the year, as against 4,434 in the year before. This disease occurs mainly among the South Indian coolies imported as estate labourers, and is showing a tendency to spread among the indigenous races in the villages in the neighbourhood of estates. The mortality from this disease in the year under review was 24.18, though it is probable (in view of the similarity of certain symptoms) that many so-called cases of malarial cachexia were in reality cases of anchylostomiasis. At the latter end of November, 1909, the Government directed that a systematic examination of dejecta for the presence of the ova of anchylostomes should take place at the Ragama immigration depot. The Medical Officer of that camp, assisted by the Medical Officer of the Mahara Jail, under the supervision of the Acting Provincial Surgeon of the Western Province, examined the dejecta of 864 arrivals from South India. The investigation revealed that, of the 864 specimens examined microscopically, 417 contained the ova of the anchylostome, either alone or with the ova of other intestinal parasites. It was thus demonstrated that 48.26 per cent. of new arrivals, examined over a period of 38 consecutive days, were infected with the parasite, but the extent of its prevalence in the planting districts of Ceylon may be considered to be considerably over that figure, because of the insanitary conditions of estate lines. Coolies from the different recruiting districts in South India, viz., Tinnevelly, Madura, Trichinopoly, Salem, North Arcot, South Arcot, Chingleput, Cuddappah, Madras District, Coimbatore, Vizagapatam, Anantapur, Nellore, the Mysore and Travancore States, were examined, and a certain percentage of infection found in all. The disease being widespread on the neighbouring continent, the daily importation of infection carriers, the continued pollution of the soil and water on estates, and the lack of efficient sanitary precautions against its spread are subjects for grave consideration. It is evident that to control the disease effectually it will be necessary to proceed on the lines indicated in paragraph 9 of the Secretary of State's despatch, No. 53 of February 4, 1909, viz. :—

(*a*) Wherever necessary laws should be enacted enforcing the provision on estates and elsewhere, where numbers of labourers are collected, of simple, inexpensive, but efficient latrines, in places appropriate both as regards the convenience of the labourers and the health of the public.

(*b*) A penalty should be imposed on persons found avoidably defecating in any place where contamination of the soil or water would be likely to cause risk of infection.

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(*c*) Each colony should be divided into convenient districts, in each of which should be appointed an inspector responsible to the local authority, medical officer, or some other authority, who should be charged with the enforcement of sanitary regulations.

(*d*) In all schools object lessons on anchylostomiasis should as far as possible be given. Leaflets containing simple information on the subject should be distributed periodically. The Committee consider that the pamphlet prepared by Dr. Nicholls, of the Leeward Islands, would form a suitable model.

(*e*) While the treatment for anchylostomiasis of the whole population is clearly impracticable, arrangements should be made for the distribution from convenient centres, such as schools, post offices, district nurse stations, &c., of anthelmintics at cost price, with simple directions for use. For this purpose beta-naphthol is the most suitable drug, thymol and other toxic anthelmintics being only used under medical supervision.

The practical difficulties in the way of achieving the above requirements are many and great, and without the energetic and intelligent co-operation of the planting interest in Ceylon it is difficult to see any prospect of amelioration. It is significant that the Provincial Surgeon of the Central Province, in which the largest number of estates are situated, states that "all officers report the increased prevalence of this disease on estates." The Provincial Surgeon of the Southern Province states that "the disease is undoubtedly spreading amongst the villages in the neighbourhood of estates." The Provincial Surgeon of the Province of Sabaragamuwa notes that "on the Galatura Group of estates no less than 568 persons out of a total labour force of 1,416 were suffering from anchylostomiasis, and that the disease is undoubtedly on the increase, and unless stringent measures are taken . . . the disease is bound to spread through the length and breadth of the Island."

Diphtheria.—There were 3 cases and 2 deaths from this disease during the year: 2 cases occurred at the Buttala Hospital with 1 death, and 1 fatal case at the General Hospital, Colombo.

Parangi.—3,485 cases of this disease were treated in the different hospitals during the year, as against 3,246 the previous year. The Western, Central, and Northern Provinces are comparatively free from the disease, while the North-Western Province, North-Central Province, Province of Uva, and Province of Sabaragamuwa continue to show a considerable prevalence.

Cancer.—In the Registrar-General's death reports there are 158 cases under the head of cancer returned. The Pathologist of the General Hospital, Colombo (Dr. A. J. Chalmers), received during the year 121 notifications of malignant disease, 9 of which indicated cases of sarcoma and 112 carcinoma. The sarcomata occurred in 4 females and 5 males; the carcinomata in 40 females and 72 males. The provincial distribution is as follows:—

Sarcoma.

Northern Province	2
Western Province	4
Central Province	2
Southern Province	1
Total	9

Carcinomata.

Southern Province	26
Western Province	52
Central Province	14
Northern Province	9
Eastern Province	1
Province of Uva	3
North-Western Province	7
Total	112

The *carcinomata* are classified as follows:—

Males.

Epithelioma penis			30
,,	cheek	16	
,,	jaw	7	
,,	lip	5	
,,	tongue	8	
,,	soft palate	1	
			37
,,	stomach		2
,,	thigh		1
,,	orbit		1
Laryngeal			1
Total			72

Females.

Cancer of the uterus		20	
,,	vagina	1	
,,	labium	1	
			22
,,	breast		5
,,	liver		4
Jaw			2
Larynx			1
Lip			1
Stomach			1
Cheek			3
Tongue			1
Total			40

Phthisis.—The Registrar-General returned 4,195 deaths from phthisis. During the year there were 1,978 cases of phthisis treated in the Ceylon hospitals, as compared with 1,318 in the year 1908.

Vaccination.—Mr. Edwin Burgess took up his duties as officer in charge of the Government Vaccine Establishment on February 3, 1909, in his capacity as Assistant Bacteriologist. His duties consist in the manufacture of pure calf vaccine lymph on modern scientific and improved methods. The requisite improvements and alterations to the calf depôt at Kanatta having been effected, and the necessary apparatus procured, satisfactory results have been reported. "Seed" lymph was obtained from Madras and from the Lister Institute, London, the latter being preserved in cold storage on the voyage out to Ceylon to ensure freedom from deterioration. Lymph was, till the establishment of the existing system, despatched from the office of the Provincial Surgeon, Western Province, to vaccinators, but at present the

manufacture and despatch of lymph is conducted at the Vaccine Institute. It is prepared and stored in bulk at a suitable temperature, capillary tubes being filled immediately previous to despatch to vaccinators in the various Provinces.

The particulars as to vaccination in the Island are as follows:—During the year 184,534 subjects were vaccinated; 169,470 were primary vaccinations and 15,064 re-vaccinations. Of the former, 145,511 were successful and 11,715 unsuccessful, and in 12,244 subjects the result of the operation was not known, as they failed to report themselves for examination on the appointed days. The percentage of successful cases to total inspected was 92.55 in primary vaccinations, as against 85.22 last year. In the case of re-vaccinations 7.951 were successful and 2,657 were unsuccessful, while in 4,456 cases the results were not known, owing to the subjects not presenting themselves for examination when required. The percentage of successful to unsuccessful operations in those revaccinated was 74.95, as against 69.51 last year.

Mr. Burgess reports that the bacteriological examination of the lymph for the last six months of the year showed a marked decrease in the number of extraneous micro-organisms as compared with the lymph obtained in the earlier part of the year: that the decrease is to be attributed to the improved conditions of manipulation, and probably to the fact that no straw or similar material was used for bedding the vaccinated calves. The most abundant extraneous micro-organisms found at the time of preparation were the *Staphylococcus pyogenes albus* and the *Staphylococcus cereus flavus*. The *Staphylococcus pyogenes aureus* was isolated on a few occasions: the *Bacillus mesentericus vulgatus*, *B. subtilis*, and a sarcina have also been identified. 58,315 tubes of calf lymph were issued.

Precautions against the Introduction of Plague.—The Plague Committee held meetings during the year. Three ports in Japan, three in China, one in Siam, two in Burma, ten in India, two in Arabia, six in Africa, two in Australia, and one in the Philippines, a total of 29 ports, were regarded as plague infected. 2,815 vessels called at the port of Colombo during the year; 826 healthy vessels from infected ports were placed in modified quarantine, and 15 vessels were placed in strict quarantine. In thirteen of these cases smallpox was the reason for quarantine, in one case it was cholera, and in one case it was suspected plague, which, however, on further observation and investigation, was pronounced not to be a case of that disease. The disinfecting station is fully equipped and worked efficiently. Cargo lighters were systematically fumigated to ensure the destruction of rats.

Lunacy.—The total number of persons treated at the Colombo Lunatic Asylum during the year was 751, being 32 less than the year previous. There were 54 deaths. In the House of Observation the total number treated was 186, of whom 3 died. The accommodation provided is inadequate for the number of inmates, and the question of increasing it may have to be considered in the near future. For further details of this institution see report of the Medical Superintendent attached.

Section III.—Meteorological Conditions and their Relationship to Disease.

The rainfall map kindly supplied to me by the Surveyor-General shows that quite half the Island was comparatively dry, *i.e.*, under 50 in. of rain during the year. The dry area embraces the Northern Province and a large part of the North-Western Province, the Eastern Province, and a large portion of the Southern Province. More rain fell in the western half of the Island than in the eastern. There was a large area in which from 50 to 75 in. were recorded, a smaller area in which there were from 75 to 100 in., portions of the Southern, Sabaragamuwa, Western, and Central Provinces from 150 to 200 in., and a small area between Hatton and Digalla where over 200 in. were recorded. It has also been noticed that the malarial seasons are influenced by the two monsoons: in the south-west monsoon the western half of the Island suffers especially from this disease, and the eastern half during the north-east monsoon. Bowel diseases are more prevalent during the rains. Respiratory diseases are more common during the chilly nights and mornings of the north-east monsoon. Enteric fever is more prevalent following a period of dryness, when the surface wells are polluted by washings from the surface of the ground.

Regarding rainfall and malarial outbreaks, our experience here is that very severe outbreaks have been known in dry weather, which is attributed to the want of rain to wash out the pools of water, and thus suitable places are left for mosquitoes to breed undisturbed. Meteorological conditions further affect the health of the people as regards their influence on the quantity of food produced in the Island and on the general condition of the people to resist disease.

Section IV.—General Sanitary Condition of the Colony and of the Chief Towns.

The general sanitary condition of the Colony cannot be regarded as satisfactory; only in the towns having Municipalities and Local Boards is any attempt made at sanitation. In other places there is an absence of proper drains, water supply, conservancy, scavenging, and the proper disposal of refuse. Even in the large towns the drainage is bad, overcrowding exists, and proper water supplies are rare.

Colombo.—The water supply is not sufficient in quantity or in distribution. In many parts of the town, especially to the south, the pressure is not sufficient to supply the upper storeys of houses. Some improvement is anticipated by the laying down of some larger mains, but the question of another main from Labugama cannot be postponed for very long, because of the tendency to increase the area of the city by including the nearest suburbs and in anticipation of the completion of the new water-carriage

system of sewers. The collection of night soil in pails, its transfer to carts in the streets, its conveyance through the thoroughfares to a pitting ground where it is buried, is unsatisfactory from a sanitary point of view, but it is carried out as well as such a system can be. These methods must be continued until the new sewers are completed. Good progress with the work of constructing Mr. Mansergh's sewage scheme has been made. The whole of that section is finished which is to drain the sewage that now finds its way into the harbour; it only requires to be linked up with the dwelling-houses.

There is serious overcrowding in many parts of the town. The scavenging is well done, but the rubbish should be burnt in a destructor, more watering of roads and streets is desirable, and watering before sweeping to avoid raising clouds of dust is imperative.

The building of the Municipal infectious diseases hospital has not been begun yet.

Cesspits and polluted wells are being closed, but the wells in general cannot be filled up until a more plentiful water supply is provided.

The surface drainage in many parts of the city is defective.

The average birth- and death-rates per 1,000 of population for the year were 25.27 and 30.77 respectively, as against 25.5 and 36.87 in the year 1908.

Useful work has been carried out to lessen the nuisance arising from the dust caused by motor cars, by covering the surface of the main roads with preparations of tar and oil.

In February a special officer was appointed as Rural Medical Officer of Health, whose duty it is to supervise the sanitation of the large villages which immediately surround the confines of the Municipality, and to carry out the provisions of the new Ordinance to control the rural dairies and laundries. One of his most useful duties is to control the spread of enteric fever by the removal of the patient to a hospital (where practicable) and the disinfection of the premises.

KANDY.—The sanitation of the town was in as satisfactory a condition as possible considering the primitive state of the drainage. The water supply remained plentiful and wholesome. A channel to divert another stream to feed the reservoir is nearing completion, and this will render possible the extension of the water supply to the more outlying parts of the town, hitherto dependent upon wells or river water. The conservancy is satisfactory. The night soil is collected in air-tight drums and conveyed to a trenching ground. Notification of certain infectious diseases, and the registration of dairies, are carried out.

GALLE.—The Municipal limits of this town cover an area of about 6½ miles, including five wards and 44 villages. The water supply is limited, serving the Fort only, and the quality of the water is unsatisfactory; it is chiefly used for washing purposes. The drinking water is obtained from wells about three miles distant, is of good quality, and sold in the town from casks, which are periodically inspected and flushed. An additional water supply scheme has been taken in hand and is progressing satisfactorily. The scavenging and disposal of refuse have been satisfactorily carried out.

Drainage.—The Fort division is provided with a satisfactory system of drainage. Other divisions of the town are being gradually provided with drainage as funds permit. Several swamps were filled in during the year. The registration and inspection of dairies, laundries, and bakeries has resulted in their being kept in a more satisfactory condition. Organized attempts at mosquito extermination were made during the year.

JAFFNA.—The water supply is entirely from wells, subject to pollution during the rains owing to their proximity to cesspits. The general sanitary condition is gradually being improved by closing as many of these as possible, and introducing the dry-earth system. Roads, drains, and public grounds are being kept cleaner. Drainage is bad owing to the flat contour of the land, and those drains that exist are merely earth cuttings incapable of conveying the surface storm water off premises; collections of storm water with its consequences follow the rains. High cadjan and live fences conduce to the stagnation of air.

BATTICALOA.—The water supply is entirely from wells, and therefore unsatisfactory, as all are more or less open to pollution. Some trial wells with pumping plant at the bar for the supply of the town have been established. Drainage is defective. Extensive low-lying tracts in the town are converted into pools after a small fall of rain, and stagnate, providing breeding places for mosquitoes and giving off offensive odours. The scavenging and conservancy are insufficient. Only a few houses have adopted the dry-earth system of conservancy. Cesspits are numerous; the surface pollution of the soil and the high cadjan fences are insanitary features.

ANURADHAPURA.—The sanitary state of the town was good during the year. Three *pokunas* or tanks were cleaned out and a large amount of impurity removed. The water supply, as the result of the drought, was poor both in quantity and quality. The Local Board effected some improvement by filling up hollows. Overcrowding in the native quarters continues.

KURUNEGALA.—The water supply is still unsatisfactory. The Local Board has effected some improvements in the matter of drainage and latrines, but paucity of funds renders the progress slow. The town retains its reputation for malaria, which is conduced by the extensive paddy cultivation. Cesspits are in dangerous proximity to wells.

BADULLA.—A separate water supply was constructed for the hospital during the year, and an improved supply to the town is desirable. Scavenging and drainage are satisfactory.

RATNAPURA.—A water supply from a reservoir has been carried out during the year; it is good in quality, and meets the requirements of a fair number of the residents. Wells open to pollution are common.

Drainage leaves much to be desired. An additional public latrine is to be shortly erected, making three in all.

SECTION V.—GENERAL.

Medico-legal.—The Government Analyst submitted 229 reports on examinations made by him during the year in connection with 601 specimens. There were 171 judicial cases involving the examination of 465 productions. Of these, 95 were cases of poisoning or suspected poisoning, in 44 of which some poison was found. Arsenic was found in 23 instances, mercury salts in 12. 161 articles were examined for blood stains, in 56 of which they were found; seminal stains were found in 5. Concerning substances sent for examination as to the presence of opium and ganja, 47 specimens were analysed and opium was found in 12 and ganga in 9. The Government Analyst reports the discovery of a poison in the tuberous root hondala (*Moddeca balmata*), which is used as an article of diet by the natives. It contains a cyanogetic glucoside, which explains the occasional fatal effect following its use.

Opium.—At the end of the year the members of the Opium Commission submitted their report, in which it was recommended that the sale of opium should be a Government monopoly; that the sale should be undertaken by officers of the Medical Department; that all consumers of the drug should be registered and allowed only a certain amount of the drug a month; that the persons practising medicine according to native methods (called vedaralas) should be registered and allowed a definite amount of opium for *bona fide* native medical practice every six months. A new draft Opium Ordinance was taken in hand.

Administrative: Hospitals, Asylums, and Dispensaries.—The Government medical institutions are, as a rule, well built, either of stone or of brick, and contain large airy wards with plenty of cubic space and superficial area. The general type of hospital is an administration block in front with wards running at right angles to it connected by covered corridors. The buildings consist of a ground floor only, and they occupy a good deal of space. The roofs are of red tiles and the floors of cement concrete. The beds are of wood or of a new form—an iron frame with a wooden platform and a thin roller mattress protected by a Willesden canvas sheet; the beds can be taken to pieces in a few minutes and thoroughly cleaned. Bedside tables are provided, and the fittings and equipment are serviceable, and in some of the institutions fairly up to date. The hospitals have been kept in good repair, and structural improvements have been carried out as far as votes will permit.

There were 73 hospitals and asylums in working, 400 Government dispensaries, and 220 estate dispensaries. No new hospitals were completed during the year, but the Lady Ridgeway Memorial Hospital for Children subscribed for by the public, a hospital at Veyangoda to be established by the munificence of Mrs. J. P. Obeyesekere, another at Moratuwa by the munificence of Mr. Charles de Soysa, were in course of construction. New Government hospitals were commenced at Koslanda and Muppane. Extensive reconstruction of the hospitals at Kelebokka and Medagama were carried out, and several other hospitals in connection with His Excellency the Governor's five-year programme have been under consideration. New dispensaries were opened at Ambalangoda in the Southern Province, Padukka in the Western Province, and Mampuri in the North-Western Province. Two new operating rooms with sterilizing and anæsthetizing rooms for the pauper section, and a new operating room for the paying section of the General Hospital were completed during the year.

The building of a new out-patient department for Colombo was commenced in September.

The latrines and kitchens of many of the hospitals have been rendered fly-proof, and the hospitals in malarious districts have been provided with mosquito-proof wards for male and female patients.

Native Attendants.—Male and female ward attendants are employed in the hospitals, who work under the direction of the nurses.

Nursery in Ceylon Hospitals.—The nursing in Ceylon hospitals is not entirely satisfactory. Some of the outstation hospitals have no nurses, while others are under-nursed. The nursing staff consists of 16 European qualified matrons and sisters, 37 European Roman Catholic sisters (untrained), 32 matrons (trained locally), 26 nurses (trained locally), and 33 pupils in training.

The European matrons and sisters are distributed as follows: One matron in the paying section of the General Hospital, Colombo; one matron in the Lady Havelock Hospital; one matron in the Kandy Hospital; one matron in the Victoria Memorial Eye Hospital; three sisters in Kandy Hospital; and nine sisters in the paying section of the General Hospital, Colombo.

The Roman Catholic sisters perform nursing duties in the general wards of the Colombo Hospital and in the Pauper Hospital at Ragama and the Kurunegala Hospital.

Two nursing schools for the training of young women exist at the Lady Havelock Hospital, Colombo, and at the Kandy Hospital. The length of the course is two years, after which a certificate of proficiency is granted to those who pass an examination. There is accommodation for 23 pupils in training.

Numbers treated.—The total number of in-patients treated in all the hospitals and asylums of the Colony was 78,065. The deaths amounted to 9,046, giving a death-rate of 11.58 per cent. of the hospital population. At the Government dispensaries 1,414,030 new cases were treated; the number of individual visits paid to Government dispensaries was 1,954,036.

Surgical Operations.—3,487 operations in general surgery were performed in all the hospitals, with .99 deaths, a death-rate of 2.83 per cent. Operations on the eye, not included in the above, amounted to 867.

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General Hospital, Colombo.—During the year under review 12,726 cases (including 448 remaining on December 31, 1908) were under treatment; 700 of these were admitted into the paying section and 11,578 into the pauper section. Of the total number treated, 10,823 were discharged, 1,847 died, and on December 31, 1909, 416 remained in hospital. The percentage of deaths to number treated was 11.68. The daily average number of patients in hospital was 482.40. Of these, 32.22 were in the paying section and 450.16 in the pauper section. 1,871 surgical operations were performed by the surgeons of the hospital (1,650 in the pauper section and 221 in the paying section),with a total mortality of 36, or 1.92 per cent. The percentage of deaths to total treated in the pauper section was 12.5, as against 10.5 last year, and in the paying section the percentage of deaths to total treated was 5.5, as against 10.8 in 1908.

The receipts in the pauper section amounted to Rs. 230.10, and the expenditure (not including upkeep of buildings, equipment, medical attendance, nursing, drugs, and surgical appliances) was Rs. 106,178.02. The receipts in the paying section were Rs. 56,296.90, and the expenditure (not including medical attendance, upkeep of buildings, nurses, drugs, and surgical material) was Rs. 43,180.57, showing a credit balance of Rs. 13,116.33. Owing to the increased rates charged to patients, authorized in January, 1909, this year is the first in which the paying section of the hospital has not been conducted at a very great loss.

Houses of Observation for Suspected Lunatics.—There are four of these institutions in the Island: one in Colombo, one in Kandy, one in Galle, and one in Jaffna. 277 patients were admitted under observation.

De Soysa Lying-in Home.—The total number of patients treated in this institution in 1909 was 1,112, as against 1,074 the year previous. Of these, 1,039 were discharged cured and relieved, 12 were removed by relatives, 22 were transferred to the General Hospital for the treatment of intercurrent disease, 17 died, and 22 were remaining at the end of the year. The percentage of deaths to total treated was 1.53, as against 1.48 the year previous.

The Medical Superintendent of the Lying-in Home has reported on the gravity of anchylostomiasis as a complication of pregnancy, 2 cases out of 19 having succumbed at the institution during the year.

In the Lying-in Home 37 pupil midwives received training during the year, of whom 20 obtained certificates after passing a satisfactory examination.

The desirability of providing estate labourers with trained Tamil midwives is obvious, and the adoption of measures to secure this is a matter for consideration, and would doubtless be conducive to reducing the infant mortality on estates, in addition to ensuring modern scientific and aseptic methods of treatment of parturition and the puerperium.

156 obstetric operations were performed at this institution during the year.

The Lady Havelock Hospital.—The total number of patients treated during 1909 was 808, as compared with 913 the year before. The mortality rate was 6.8 per cent. Thirty-four surgical operations were performed, with one death. The daily average sick was 29.84.

The number of attendances at the female outdoor dispensary during the year was 32,244, with a daily average of 103.

The Victoria Memorial Eye Hospital and Grenier Outdoor Dispensary.—There were 709 admissions to the Eye Hospital during the year, 31 of whom were paying patients. The daily average sick was 43.40. The expenditure was Rs. 10,755.29, and the receipts Rs. 2,739.16; the net cost for the year was, therefore, Rs. 8,016.13. The number of operations performed on in- and out-patients was 867. The Institution is growing in repute and popularity, and at times its accommodation is severely taxed.

Police Hospital, Colombo.—636 patients were treated in this Hospital, as compared with 505 the previous year. One patient died. The daily average of sick was 12.16, as compared with 8.57 in 1908.

Branch Hospitals at Colombo and Galle for the Treatment of Women suffering from Venereal Diseases.—445 patients were treated in the Colombo Institution, showing an increase of 60 over the return for the previous year. The average daily sick was 18.70. At the Galle Branch Hospital 119 patients were treated, as compared with 160 the year previous. The daily average sick was 8.41.

Gaols, Hospitals, and Sick Prisoners.—In 1909 15,971 prisoners were admitted into the different gaols of the Island. The average daily strength of prisoners was 3,348.21. The number treated in gaol hospitals during the year was 8,319, as compared with 5,667 the previous year. The total number of deaths was 346 in 1909, as against 205 in 1908. The following table gives the number of admissions, number of deaths, average strength, death-rate to admission to gaol hospitals, and to average strength during the past five years:—

Year	Admissions to hospitals	Number of deaths	Average daily strength of prisoners	Death-rate per cent. to admissions	Death-rate per 1,000 of average strength
1905	4,887	95	2,864.64	1.94	33.16
1906	4,776	110	3,153.26	2.30	34.88
1907	5,617	113	3,334.88	2.01	33.88
1908	5,667	205	3,371.97	3.61	60.79
1909	8,319	346	3,348.21	4.15	103.33

Of the diseases which caused so much increased sickness and high death-rate, bowel diseases head the list with 3,015 admissions and 140 deaths for diarrhœa, and 827 admissions with 59 deaths for dysentery. There were 1,050 admissions for malaria, with 10 deaths; 206 cases of injury, with

one death. Admissions for all other diseases totalled 3,221, with 136 deaths. The only bright spot in the above gloomy record is that there were only four cases of enteric fever, two of which died.

Colombo Gaols:—

	Average daily strength	Average daily sick	Per cent. sick to strength	Total deaths	Per cent. deaths to strength
Welikada...	759.74	49.26	6.48	117	.042
Mutwal	387.63	24.94	6.43	46	.033
Hulftsdorp	149.22	2.53	1.70	7	.013
Mahara	597.70	25.59	4.28	34	.016

Welikada, Mutwal, and Mahara are "hard labour" gaols, and the increase in the sick- and death-rates was among the "hard labour" prisoners. The sick-rate at Mutwal was 50 per cent. over the previous year, and the death-rate three times as much. At Mahara the sick- and death-rates were double those of 1908. The health is somewhat better at present, which may be attributed to a concession granted to the Gaol Medical Officers to recommend a better diet to prisoners who appeared to be not getting sufficient nourishment, and to recommend fractions of the tasks allotted to prisoners who were too weak to perform whole tasks. A further alteration in the diet of prisoners was made in November by the introduction of the No. 1 penal diet (bread and water) for the first fortnight of a prisoner's sentence, but a good diet was allowed after the second month.

Kanatta Infectious Diseases Hospital.—956 cases of infectious diseases were treated at this Institution during the year, as against 1,739 in the year previous. The diseases included small-pox 192, with 46 deaths; chicken-pox 614, with 2 deaths; acute diarrhœa 4, all of which died; measles 106, with 1 death; mumps 26, without mortality; cases under observation 14, with 1 death.

The Victoria Home for Incurables, Colombo.—At this Institution 60 remained on December 31 of the previous year, 20 were admitted during the year, making a total of 80 cases, of whom 6 were discharged and 8 died; 66 remained on December 31, 1909.

Bacteriological Institute and Clinic for Tropical Diseases.—The total number of specimens sent for bacteriological examination was 2,000. The fees collected were Rs. 581. The building used as a clinic for tropical diseases is not very suitable for this purpose. It is a portion of the old lunatic asylum converted to its present use. For purposes of research it will be necessary to provide a new clinic in the near future. The most convenient locality would be in the grounds of the General Hospital, when the rebuilding of that institution is decided upon.

Research work was carried out by the Director (Dr. Castellani) in the following subjects:—

(1) Tropical diseases of the respiratory organs, bronchomycosis and bronchial spirochætosis.

(2) A peculiar kind of diarrhœa due to a new species of Spirillum, *S. indicum* (Castellani).

(3) Several skin diseases not yet described, such as keratoma plantare sulcatum, chloasma bronzinum, acro-dermatitis, vesiculosa, &c.

(4) A new species of fungus causing dhoby itch.

The details of the above investigations will be found described in the reports to the Advisory Committee of the Tropical Diseases Research Fund.

Total Hospital Deaths.—The total deaths numbered 9,046, as compared with 9,352 in 1908. A table showing the death-rate per centum in the various hospitals and asylums of the Island for the year is given below, the death-rates among mixed races and immigrant Indians being shown separately:—

Hospitals	Mixed Races 1909	Indians 1909	Total 1909
Civil	8.60	19.44	10.88
Field	4.88	11.71	5.95
Immigrant ...	4.69	8.44	5.52
District	6.22	21.24	16.62
Asylums	7.22	10.81	7.31
Other Hospitals ...	21.99	4.37	2.58
	7.72	19.78	11.58

Hospital Accommodation.—This was generally sufficient. Overcrowding took place in some of the hospitals of the planting districts and in Colombo.

With the exception of the following institutions, Matale, Jaffna, Dambulla, Mannar, Puttalam, Chilaw, Nikaweratiya, Balangoda, Trincomalee, and Dandugama, the water was reported to be good, pure, wholesome, and abundant. Water for drinking purposes is, as a rule, filtered before use. Water-supply schemes for Nanu-oya, Balangoda, Tillicoultry, and Uda Pussellawa, are under consideration. All hospitals are provided with separate bathrooms for males and females and furnished with tubs or douches. Patients who can help themselves prefer to bathe in streams when there are such adjoining a hospital.

The drains are surface ones for carrying away ward washings and storm water.

The conservancy of the latrines is entirely on the dry-earth system. The excreta is removed daily and buried, or incinerated at some distance from the hospital. Doulton's earthenware squatting plates have been introduced into most of the hospitals.

Inspection.—The hospitals and dispensaries were regularly inspected by myself and the Provincial Surgeons of the respective Provinces.

Food Supply.—The provisions for the various hospitals were supplied by contractors approved by Government. The food is inspected by the medical officers of the hospitals before it is served to patients, and any samples not approved are rejected. Contractors offering inferior samples are fined.

Dispensaries.—There are 400 dispensaries in the Island; 347 of these are civil dispensaries and 53

district dispensaries in the planting districts. Besides the latter, there are 220 estate dispensaries, being 24 in excess of the previous year. In the Western Province there are 43 dispensaries, in the Central 62, in the Northern 50, in the Southern 48, in the Eastern 43, in the North-Western 48, in the North-Central 38, in Uva 36, and in Sabaragamuwa 32. In these dispensaries 1,414,030 patients were treated, who paid 1,954,036 visits, against 1,321,002 patients with 1,902,715 visits in 1908.

Port Duties and Immigration.—2,815 vessels called at the port of Colombo during 1909, as compared with 2,774 the previous year.

The total number of deck passengers from South Indian ports during the year was 1,555,196, as compared with 177,550 the previous year. The number of estate coolies was 79,497, as compared with 88,788 the year previous. The number of miscellaneous deck passengers was 75,699 in 1909, as compared with 88,762 in 1908. Of these arrivals, 12,670 were vaccinated at the vaccine station at the root of the Breakwater. Estate coolies are vaccinated at Ragama.

No case of plague was landed. Cases of small-pox, cholera, and scarlet fever, were sent to the Infectious Diseases Hospital. Disinfection of infected clothes was carried out satisfactorily.

The Ragama Camp.—The total number of estate coolies who passed through the Ragama Camp in 1909 was 80,526, as compared with 89,751 in 1908. Of these, 21,837 were from cholera-infected districts in South India or were cholera contacts, 1,648 were from small-pox-infected districts, 333 persons from plague-infected areas, being mostly sepoys of the 98th Native Infantry sent to the Camp by the Military Authorities for detention under observation during the required quarantine period, making a gross total of 23,818. 30,275 estate coolies were vaccinated, as compared with 31,619 in 1908. There were three cases of cholera in the Camp during the year, one case proving fatal. No case of small-pox occurred in the Camp during the year. The general health of the Camp was good. The excreta were incinerated; a new incinerator on the lime-kiln pattern was introduced during the year and worked satisfactorily, supplementing the smaller one in use previously. The water service was improved by the installation of a powerful steam pump.

Medical College.—The College consists of lecture hall, students' library, laboratories for chemistry, physiology, pathology, and biology, a dissecting room, offices, photographic rooms, museum, the Colonial Medical Library, and a separate building for lady students. There were 181 students in attendance at the end of the year, of whom 147 were registered medical students and 34 apothecary students, as compared with a total of 155 students during 1908. Ten students qualified in medicine and surgery and received their diplomas licensing them to practice, as compared with 16 in 1908. Seven apothecaries passed out, as against 10 in the previous year. A new medal for operative surgery has been endowed in perpetuity to commemorate Dr. Garvin's long connection with the College.

To encourage the apothecary students to enter the College and to join the Ceylon Medical Department, Government has abolished the fees that were formerly paid by them, and no certificates of having passed the final examination will be given in future.

Post-Graduate Lectures.—This course of lectures to medical officers of outstations was held for a fortnight in March.

The Medical Council.—The work of the Council during the year 1909 was considerable, the many petitions and inquiries with regard to applicants for registration occupied much time. Twenty practitioners were registered in 1909.

Civil Medical Stores.—The total cost of drugs, chemicals, and instruments in 1909 was Rs. 225,763.10, as against Rs. 244,215.78 in 1908, showing a saving of Rs. 18,452.68, notwithstanding that with the yearly extension of the Department more drugs, &c., were used.

During the year 1909 there were 2,052 estates scheduled to 33 districts and 31 sub-districts, with 21 district hospitals and 30 dispensaries and 14 civil hospitals and dispensaries, to attend to the medical wants of which the following medical officers were employed: Medical Officers, First Grade, 3; Medical Officers, Second Grade, 11; Medical Officers, Third Grade, 16; and 67 Apothecaries.

During 1909 there were 16,829 estate labourers treated in the district hospitals and civil constituted district hospitals, against 17,091 in 1908. Of these, 3,480 died—a death-rate of 20.67 per cent. Of the mixed races 18,310 were treated, of whom 1,475 died—a death-rate of 8.03 per cent.

In the civil hospitals, worked partly as district hospitals, the death-rate of estate labourers was 21.25 per cent., whilst in the district hospitals it was 20.40 per cent. The highest death-rate (38.50) among the estate labourers occurred in the Civil Hospital at Ratnapura, and the lowest (nil death-rate) in the Civil Hospital at Mulhalkele. The admissions into the former were 670, and into the latter 18.

The total number of days the estate labourers stayed in hospital was 410,880, an average of 24.41 days each; of these, 292,291 were paid for by the estates, the rest being charged to the fund. The total number of days the mixed races stayed in district and civil hospitals was 234,649, an average of 12.81 days.

The total number of estate labourers treated at the outdoor dispensaries was 73,320. The total number of estate labourers treated on estates was 34,659.

The total number of births reported from estates was 16,376, of which 7,940 were males, 7,776 females, and 660 were stillbirths.

The number of deaths reported from estates was 14,028, of whom 6,901 were males, 7,120 were females, and in one case the sex was not stated.

APPENDIX.

Report on Malaria for 1909.

The actual amount of malaria existing during 1909 may be gauged by the number of persons

suffering from that disease who attended Government medical institutions for treatment. These institutions may be divided into two classes, the outdoor dispensary and the hospital. At the outdoor dispensaries 501,738 cases were treated, as against 502,307 in 1908; at the hospitals there were 11,117, as against 11,492 in 1908. The total numbers treated in dispensaries and hospitals were 512,855 in 1909 and 513,799 in 1908. The deaths from malaria in hospitals numbered 612 in 1909, as against 718 in 1908. There is no record of the numbers who died while under treatment at the outdoor dispensaries. The malarial cases treated in the gaol hospitals and dispensaries are not included in the above figures.

The measures taken to eradicate malarial fever in 1909 were similar to those employed during the previous year, viz., (*a*) education, (*b*) improved sanitation, (*c*) quinine prophylaxis.

Under (*a*) the provincial surgeons when on inspection tours, the medical officers in charge of hospitals, and apothecaries in charge of dispensaries, gave simple lectures on the cause and prevention of malaria to the villagers. Thirty-seven school teachers attended a course of sanitary instruction with special reference to malaria at the Medical College, Colombo. Four of the teachers were unable to complete the course; of the remainder, all but one obtained over 50 per cent. of marks in the examination held at the conclusion of the course. A simple syllabus on sanitation has been drawn up for the use of pupils in grant-in-aid vernacular training schools.

There was a wide distribution of pamphlets in the vernacular languages, setting forth in a simple manner the cause of malaria and its prevention.

Improvement in the general sanitation of small towns has been noticed during 1909; surface drains have been introduced into places where there was no drainage previously and extension of existing drains in others, brushwood has been cut down in the neighbourhood of dwellings, hollows have been filled up, and pools of water drained, but no large works for the destruction of the malarial mosquito have been undertaken. I regret that the suggestion for the formation of "mosquito brigades" has not been followed.

It may be said that the attitude shown by the large majority of the people towards malaria is one of apathy; on the part of local authorities it is to a great extent due to want of money to carry out the necessary propaganda for the extermination of the anophelinæ. In my opinion some legislative enactment is necessary to compel Municipalities, Local Boards, and the general public to carry out the ordinary simple means by which the eradication of malaria may be accomplished.

All Government hospitals in malarial districts are being provided with mosquito-proof wards for the reception of malarial fever patients.

The principal means in use in this Colony for the reduction of malaria is by the distribution of free quinine. This has had a marked effect in reducing the amount of this disease, particularly in the gaols and schools; in other words, where it is given to people under discipline. The Manager of the C.M.S. Schools writes: "I have just returned from a tour round our schools, and though I could not in all cases get a report showing names of patients and dates when quinine was given with results of treatment, yet I did get these figures in one or two schools, and I am perfectly satisfied that the results of administering quinine regularly are not only beneficial, but acknowledged to be so by the people, so that they actually ask for the medicine. At one place in the jungle the attendance for the week preceding my visit was 81.2 per cent. of the possible total, which is splendid for this season. The teacher affirmed that had not quinine been administered regularly these results would have been impossible at this time of the year."

We have not tried here the effect on malaria of the introduction into large collections of water of small fish, which destroy the mosquito larvæ. Serious outbreaks of malaria in dry years have been noticed frequently in this country, and a probable reason for these outbreaks is the destruction of fish during droughts, as suggested by Lieut-Colonel J. Chaytor-White, I.M.S., at the Imperial Malaria Conference at Simla last year.

The total amount of quinine issued from the Civil Medical Stores was 76,679 oz., which cost Rs. 42,273.45.

As in the previous year, a "spleen census" was taken towards the end of 1909. The estimated population of children under 15 years of age was 1,633,711; in 1908 this population was estimated at 1,622,766. This year 317,694 persons were examined, and enlargement of the spleen was found in 66,141, as against 92,258 persons and 31,421 enlargements found in the 1908 census. The spleen rate this year was 20.81, and the average spleen 1.75; last year the spleen rate was 34.05, and the average spleen 2.29.

Colonial Medical Reports.—No. 10.—Bahamas.

MEDICAL REPORT FOR THE YEAR 1909.

By J. BAIRD ALBURY, M.R.C.S., L.R.C.P.,

Acting Medical Inspector.

THE general health of the Colony during the past year has been satisfactory. No disease assumed epidemic proportions; a few sporadic cases of typhoid fever occurred in the Island of New Providence from an unexplained source of infection, but there have been fewer cases than usual; careful inquiry has not discovered a human carrier.

The street drainage of the City of Nassau, reported in previous years as being in an unsatisfactory condition, is now a distinct menace to the health of the community, and radical measures are urgently needed.

The scavengering of the city has been fairly good, but there is still room for improvement in this respect.

The water supply from wells and cisterns has been good and plentiful.

The rainfall during the year was 44.48 in., a considerable decrease from the previous year, when 69.94 in. were registered.

For the first time for many years it has not been considered necessary to declare a quarantine against Cuban ports during the summer months, a tribute to the success of their fight against yellow fever.

Anti-mosquito laws have not been enforced in this Colony as rigorously as their importance demands, but I hope the coming year will show an improvement in this respect.

The annual return of births and deaths for the Colony are shown in the table of the report.

Seventy-two successful vaccinations were performed in New Providence during the year, and 593 on the out-island settlements. The lymph used did not prove as active as was expected, but the last supply was from Dr. Renner's establishment, and, so far as is known, is the best we have had for many years.

RETURN OF DISEASES AND DEATHS IN 1909 AT THE **Bahamas Hospital.**

GENERAL DISEASES.	Admissions	Deaths	Total Cases Treated
Alcoholism	10	2	10
Anæmia	4	1	4
Debility	16	7	17
Dysentery	9	1	9
Enteric Fever	3	3	3
Erysipelas	1	1	1
Gonorrhœa	15	—	20
Influenza	9	3	9
Leprosy	—	—	—
(*a*) Nodular	1	1	3
(*b*) Anæsthetic	1	—	5
Malarial Fever—	—	—	—
(*a*) Intermittent	7	—	7
(*b*) Pernicious	1	1	1
New Growths—	—	—	—
Non-malignant	17	—	18
Malignant	12	6	12
Rheumatism	3	—	3
Septicæmia	3	2	3
Syphilis	—	—	—
(*a*) Secondary	12	—	13
(*b*) Tertiary	18	2	22
(*c*) Congenital	6	3	6
Tetanus	1	—	1
Tubercle	51	24	60
LOCAL DISEASES.			
Diseases of the –			
Cellular Tissue	12	—	12
Circulatory System	29	13	31
Digestive System	18	5	18
Eye	8	—	13
Generative System –	—	—	—
Male Organs	47	—	48
Female Organs	6	—	6
Nervous System	32	8	72
Respiratory System	4	1	4
Skin	21	1	24
Urinary System	7	3	8
Injuries, General, Local—	34	2	33
Parasites	10	—	10
Poisons	3	—	3
Surgical Operations	94	2	100

Colonial Medical Reports.—No. 11.—Grenada.

MEDICAL REPORT FOR THE YEAR 1909.

Submitted by The Colonial Secretary.

GRENADA: POPULATION FOR THE YEAR 1909.

Estimated number of inhabitants at 31st December, 1908		72,988
Estimated births during the year 1909	2,557	
Estimated deaths during the year 1909	1,385	
Increase of		1,172
Estimated number of inhabitants at 31st December, 1909		74,160

REPORTS OF DISTRICT MEDICAL OFFICERS.

DISTRICT No. 1.—ST. GEORGE'S.

Population.

The estimated population of the district for the year under review would be about 7,435, and is obtained by adding the excess of births over deaths to the population of the previous year; the number of deaths returned from the Colony Hospital is excluded in this calculation.

The births were 41 less, the deaths 30 less, and the total population 99 more respectively than in the previous year; no account is taken in this calculation of the effect of emigration or immigration.

It will be noted that the death-rate recorded is very low.

During January and the latter part of the year there was a good deal of sickness in the district, which was caused by a prevalence of influenza and an increase in the number of cases of malarial fever during those months.

The number of cases of influenza seen during October and November was 150; the character of the disease was on the whole mild, only two deaths being attributed to it.

The mortality, which was low, being represented by only 79 deaths, was fairly evenly distributed over the whole year; no one season being especially responsible for this number.

The rains occurring in January and at the end of the year determined the greater incidence of sickness at those particular periods.

Remarks on Particular Diseases that have occurred during the Year.

Pulmonary Tuberculosis.—This disease still maintains a marked prevalence; its course is generally a very rapid one; this condition being to a great extent occasioned by the fact that those who are afflicted generally come under treatment only when the disease is already far advanced, and also by the absence of any hospital accommodation for such cases.

Yaws.—Six cases were sent in by me to hospital during the year, but only one of them occurred in the district.

Dysentery.—There were 57 cases with four deaths; the majority occurred during July, August, and September.

Malarial Fever.—This disease was represented by 385 cases, showing a small increase on the numbers treated during the past two years. Three deaths were recorded under this heading, which represents a very low mortality.

Syphilis.—This disease maintains its prevalence; there was an increase on the numbers seen in the previous year.

Measures have been adopted for facilitating the more thorough treatment of this disorder.

Typhoid Fever (Enteric).—There were twelve cases with one death; all occurred in the town, and were scattered in distribution.

None of the cases received hospital treatment, and the spread of the disease was kept within bounds

METEOROLOGICAL RETURN FOR THE YEAR 1909.*

	Temperature.					Rainfall.		Winds.	
	Solar minimum F.	Solar maximum F.	Shade minimum F.	Shade maximum F.	Range F.	Mean tension of vapour F.	Amount in inches in.	Degree of humidity per cent.	General direction	Average force
January	130.0	144.2	70.0	86.0	16.0	.729	4.61	75.0	N.E.	20
February	129.0	144.0	70.0	83.4	13.4	.675	5.15	71.0	N.E.	35
March	136.0	143.0	70.0	86.0	16.0	.707	1.02	72.0	N.E.	61
April	127.0	144.0	68.6	86.0	17.4	.764	3.82	76.0	N.E.	38
May	124.0	143.0	72.0	88.0	16.0	.793	5.79	76.0	N.E.	35
June	97.0	135.0	70.4	86.0	15.6	.787	12.20	79.0	N.E.	52
July	112.0	136.0	72.0	86.0	14.0	.787	12.42	78.0	N.E.	39
August	102.0	140.0	70.8	88.8	18.0	.823	7.70	78.0	N.E.	31
September	121.0	142.2	71.4	90.8	19.8	.834	6.86	77.0	S.E.	30
October	97.0	141.0	73.0	87.0	14.0	.821	11.84	78.0	S.E.	38
November	121.0	140.2	70.0	86.6	16.0	.825	5.03	78.0	S.E.	42
December	126.0	141.0	71.0	87.0	16.0	.726	4.10	72.0	N.E.	31
Averages	118.6	141.3	70.8	86.8	16.0	.772	80.54	75.8	N.E.	45.2

* At Richmond Hill Meteorological Station in the south of the island.

RETURN OF DISEASES AND DEATHS IN 1909 AT THE FOLLOWING INSTITUTIONS:—

Colony, Yaws, St. Andrew's, and Carriacon Hospitals, Grenada.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	2	—	2
Anæmia	10	—	12
Anthrax	—	—	—
Beri-beri	—	—	—
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	—	—	—
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	13	1	13
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	1	—	1
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	1	—	1
Enteric Fever	65	8	65
Erysipelas	—	—	—
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	3	—	3
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	3	—	3
Kala-Azar	—	—	—
Leprosy	—	—	—
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	—	—	—
(*c*) Mixed	—	—	—
Malarial Fever—	—	—	—
(*a*) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	79	2	81
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	—	—	—
(*c*) Pernicious	—	—	—
(*d*) Malarial Cachexia	21	—	23
Malta Fever	—	—	—
Measles	—	—	—
Mumps	—	—	—
New Growths—	—	—	—
Non-malignant	5	—	5
Malignant	2	—	2
Old Age	9	2	9
Other Diseases	16	—	16
Pellagra	—	—	—
Plague	1	—	1
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	37	—	43
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	—	—	—
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	—	—	—
Syphilis	—	—	—
(*a*) Primary	5	—	7
(*b*) Secondary	7	—	7
(*c*) Tertiary	26	1	28
(*d*) Congenital	1	—	2
Tetanus	3	1	3
Trypanosoma Fever	—	—	—
Tubercle—	13	1	14
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—
GENERAL DISEASES—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	1	1	1
Varicella	—	—	—
Whooping Cough	—	—	—
Yaws	361	1	420
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	48	1	52
Circulatory System	—	—	—
(*a*) Valvular Disease of Heart	34	9	39
(*b*) Other Diseases	13	10	13
Digestive System—	120	10	127
(*a*) Diarrhœa	5	—	6
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	2	—	2
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	2	1	2
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	2	—	2
(*g*) Cirrhosis of Liver	1	1	3
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	—	—	—
Ear	2	—	2
Eye	32	—	36
Generative System—	—	—	—
Male Organs	49	—	51
Female Organs	70	4	84
Lymphatic System	16	—	22
Mental Diseases	—	—	—
Nervous System	21	3	26
Nose	6	—	6
Organs of Locomotion	46	—	47
Respiratory System	23	4	27
Skin—	178	—	124
(*a*) Scabies	—	—	—
(*b*) Ringworm	—	—	—
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	—	—	—
(*f*) Other Diseases	—	—	—
Urinary System	77	5	89
Injuries, General, Local—	45	3	47
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	—	—	—
Parasites—	—	—	—
Ascaris lumbricoides	6	—	6
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	46	—	47
Filaria medinensis (Guinea worm)	—	—	—
Tape-worm	—	—	—
Poisons—	—	—	—
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—			
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

by the due observance of strict antiseptic precautions.

In few instances only could the source of infection be traced to a pre-existing case.

General Sanitary Condition of District.

The general sanitary condition of the district was on the whole good; the most disturbing factor from a public health point of view being the occurrence of the twelve cases of typhoid fever already referred to.

A definite reduction in the number of cases of malarial fever has been noticed within recent years and since drainage operations were undertaken at the Tanteen.

The water supply is good and plentiful.

Vaccination.

During the year 187 successful vaccinations of infants were performed; this number is slightly in excess of that returned for the last year.

Travelling regulations have been again instrumental in securing the re-vaccination of a very considerable number of adults.

MEDICAL RELIEF.

Return of Duties performed under the Medical Relief System.

No. of attendances on paupers and aged	1,128
,, ,, labourers' children	1,498
,, ,, labourers	1,393
,, prescriptions issued—free	1,662
,, ,, ,, —payment	1,538
,, vaccinations successfully performed	187
,, deaths certified	59
,, *post-mortem* examinations	4
,, midwives certified	2
Total	7,471

The totals for the previous two years were 6,453 and 7,070 respectively.

Quarantine.

Quarantine restrictions were imposed during the year against Venezuela and Trinidad for plague, and against Venezuela, Barbados, and Martinique for yellow fever.

All passengers arriving from these places, during the prevalence in them of the disease mentioned, were subjected to surveillance for the prescribed periods, and all ships were fumigated where satisfactory certificates to that effect were not produced or when circumstances demanded it.

I am in the happy position of stating that neither of these diseases were introduced here.

G. W. PATERSON,
Medical Officer and Health Officer.

DISTRICT No. 2—RICHMOND HILL.

This is a rural district on the boundary of the town of St. George, with an estimated population of about 4,500. It is mostly on high ground, from 400 ft. to 800 ft. above the sea, but certain parts, *i.e.*, Woburn and Caliviny, are low-lying, extending down to the sea.

This is generally a very healthy district, and this year it seems to have been above the average. Malarial fever prevailed during the latter half of the year, but was of a very mild type. There was an epidemic of influenza in October and November, but there were no deaths certified as a result of this complaint. Pulmonary tuberculosis seems to have been more prevalent than usual. Diarrhœa and dysentery seem to have been less prevalent than during the two or three years immediately preceding.

There were twelve cases of yaws reported in the district during the year.

The vaccination of infants was thoroughly carried out; the supply of lymph was plentiful and of good quality. The number of infants successfully vaccinated was 172.

The water supply of St. Paul's District is an abundant one, and the quality is excellent; while the supplies for Woburn and Caliviny are the reverse.

Under the Medical Relief Scheme the following attendances were given: Labourers' children, 685; paupers, 111; labourers, 652: total, 1,448.

There were 54 deaths certified.

Two inquests were held.

Only one case was notified under the Infectious Diseases Ordinance. This patient recovered and no other cases occurred.

E. F. HATTON.

DISTRICT No. 3.—ST. GEORGE'S.

During the year there were 105 deaths and 254 births, as compared with 140 deaths and 287 births in 1908. Thirty deaths occurred of infants under 1 year old.

The year was an exceptionally healthy one. There was no serious epidemic during the year, the only disease of an epidemic nature being mumps. October was the most unhealthy month owing to the prevalence of malarial fevers and diseases of the intestinal tract.

The highest mortality occurred in November and December, and was chiefly in children suffering from intestinal atrophy (or marasmus) following on attacks of enteritis during the previous months.

The sanitary condition of the district continues to be satisfactory.

Two hundred and twenty-five vaccinations were performed during the year as compared with 233 in the year 1908. The supply of lymph was uniformly good throughout the year.

The following were the attendances under the Medical Relief Scheme: Labourers, 1,052; labourers over 60, 31; paupers, 35; labourers' children under 10, 1,069; total, 2,187.

Two *post-mortem* examinations were performed during the year by instructions from the Coroner.

T. C. ORFORD.

DISTRICT No. 4.—GOUYAVE.

The following is the population, &c., for the St. John's portion of the district: Population, 8,339; births, 281; deaths, 166; birth-rate per 1,000, 33·7; death-rate per 1,000, 19·9.

During the year the general health was satisfactory, and with the exception of two cases of varioloid, no infectious formidable disease was recorded.

Colonial Medical Reports.—No. 11.—Grenada—*(continued)*.

The greatest number of attendances on children were for diseases of the alimentary tract, and the cause of the prevalence of these maladies is the improper and insufficient food that is given both to infants and young children: arrowroot pap at 1 week, ground tannia at 6 to 8 weeks, bananas and blogoes at 12 months or even before that age, represent fairly correctly the diet scale of many of these young patients. Milk as a food for infants and young children is recognized by a few of the parents, but poverty often seems to prevent its being included in the diet of these little ones. Gastro-enteritis was responsible for 35 of the deaths amongst this class of patients.

A total of 246 cases of dysentery was recorded; of these 61 were adult cases and 185 children and infants.

Malarial fever was not so prevalent as usual, and the type of fever was milder than the general run of cases usually are. The deaths from this disease were only 6 in number.

April, May and June were the healthiest months, January, October, November the most unhealthy.

The relative mortality of the different quarters of the year were as follows: First quarter, 60; second quarter, 24; third quarter, 27; fourth quarter, 53.

Sixteen cases of pulmonary phthisis were attended, and 12 deaths attributable to this disease were recorded.

During the months of October and November there was a small epidemic of influenza, 53 cases being recorded. The type of the disease was mild.

Yaws.—I am unable to report any diminution in the prevalence of this disease. A good many cases were sent to the institution, but there are still cases in the district which form nuclei for the development of other cases and at present no beds are available.

During the year 284 successful vaccinations were performed. This compares favourably with the numbers done in the previous year, when 291 were performed, with 45 more births registered.

Under the Medical Relief Scheme the following attendances were given: Paupers and aged over 60 years, 110; labourers' children, 1,292; police and prisoners, 13; labourers, 921.

R. D. O'NEALE.

DISTRICT No. 5.—ST. PATRICK'S.

The following table, comparing the estimated population, &c., of the year under review with the figures for the three preceding years, shows a reduction in both the birth- and death-rates:—

	1906	1907	1908	1909
Estimated population ...	8,289	8,433	8,632	8,801
Births	342	302	356	302
Deaths	209	158	157	133
Birth-rate per 1,000 ...	41.25	35.81	41.24	34.3
Death-rate ,, ...	25.21	18.73	18.18	15.8

Of the 118 deaths certified the age incidence was as follows:—

One year and under ...	20	...	17 per cent.
Between 1 and 2 years ...	26	...	22 ,,
,, 2 and 5 ,, ...	6	...	5 ,,
,, 5 and 20 ,, ...	11	...	9 ,,
,, 20 and 60 ,, ...	21	...	18 ,,
Over 60 years	34	...	29 ,,

The large percentage of 39 occurred in children of 2 years of age and under. This is not unusual with the large labouring population, and is to be attributed mainly to improper feeding and poverty.

Malarial fevers and gastro-enteric disorders formed the bulk of the cases treated during the year.

At Isle de Rhonde during the months of September, October and November the disease was very prevalent, hardly any one escaping an attack of fever. Every child I saw there had an enlarged spleen.

Gastro-enteric disorders were almost exclusively met with in children under 2 years of age, and was the main cause of the large infantile mortality.

An epidemic of influenza swept over the district during the last quarter of the year. Fully nine-tenths of the population were affected by it. Though severe it was strictly bronchial in type, there being comparatively few cases of pulmonary or other grave complications.

The general mortality varied but little in the different seasons, the quarterly distributions being as follows: First quarter, 35; second quarter, 26; third quarter, 25; fourth quarter, 32.

The meteorological conditions did not prejudicially affect the general health. The rainfall was up to the average and evenly distributed. There was an absence of heavy downpours and continuous rain during the wetter months, a circumstance to which I attribute the comparatively few cases of dysentery and diarrhœa, the development of which is favoured by continued wet and damp.

Two cases of mild modified small-pox occurred during the year, one in March the other in June. The origin of both cases was obscure. There was no mortality.

Yaws continued as prevalent as heretofore and difficulty was experienced in getting patients admitted to the Yaws Hospital. Although a greater number than in previous years obtained admission yet no impression seems to be made on the prevalence of the disease.

Pulmonary tuberculosis was often met with. The hopelessness of treatment in the poorer classes is year by year more apparent. Circumstances and surroundings preclude anything like satisfactory treatment, while the risk of infection to other members of the family is considerable.

Venereal diseases were rather common during the year, and there has been a gradual increase in the number of cases noted during the past few years. Syphilis was comparatively rare. The primary and secondary lesions were very seldom indeed seen. The forty-four cases of the disease recorded represent, with few exceptions of congenital origin, tertiary ulcerations. The other varieties of venereal diseases in their several manifestations were the most common, and the distressing feature attending the cases is the want of appreciation on the part of the masses of the gravity of this class of disease.

Under the influence of natural agencies the general sanitary condition of the district remained normal.

The streets of the towns of Sauteurs and Victoria received adequate attention. Backyards were not kept in as clean a condition as they might be. Drainage in both towns remains unsatisfactory.

Victoria remains the only town in the island without a water supply.

Overcrowding in the houses of the poorer classes, the improper disposal of refuse and night soil, the indiscriminate burials in parts remote from the towns, where only recognized burial grounds are situated, remain lamentable features in the sanitation of the district.

Two hundred and fifty-nine successful vaccinations were performed during the year in infants under 1 year of age. The general population remains well protected against genuine small-pox.

Summary of the work done under the Medical Relief system, &c.: Free prescriptions, 2,347; payment prescriptions, 1,027; deferred pay tickets, 249; free attendances on paupers, 266; free attendances on children, 1,251; free attendances on aged labourers, 117; attendances on labourers, 1,253; successful vaccinations, 259; unsuccessful, 30; inquests, 6.

In connection with cases of mild small-pox: Visits made to isolation station, 30; vaccination of contacts and patients, 16; disinfection of houses, 4.

H. Bishop.

District No. 6.—St. Patrick's.

The estimated population for the year under review, together with the birth- and death-rates, and also those of the two preceding years, are as follows:—

	1907	1908	1909
Estimated population ...	9,163	9,358	9,545
Births	316	353	327
Deaths	153	165	140
Birth-rate per 1,000 ...	34.5	37.7	34.2
Death-rate ,, ...	16.6	17.6	14.6

A large percentage of the deaths occurred in children, due to the usual causes, poverty and ignorance. The birth-rate is slightly below the average, but the death-rate is the lowest recorded for the last decade.

The usual observation that more sickness prevailed during the wet season than during the dry was again made.

Gastro-intestinal disorders, malarial fevers, and dysentery, in the order named, were the principal diseases dealt with during the year.

The rainfall was seasonable and abundant, the result of which was increased production of provisions and other crops generally, by which public health must necessarily have been benefited, as is shown by the comparatively low mortality.

Among other causes affecting public health I must make the usual enumeration: Overcrowding in individual houses, want of ventilation in these, impure water supply due to indiscriminate pollution of the streams from which the supplies are obtained, and the want of proper control over the burying of the dead with respect to locality and depth of graves. I strongly invite the attention of the Government to the two latter causes.

The following table gives the more important diseases dealt with during the year:—

	No. of cases
Dysentery...	224
Malarial fevers	1,347
Malignant new growth	1
Pulmonary tuberculosis	30
Syphilis	545*
Tetanus	4
Yaws	42
Leprosy	1
Influenza	Epidemic

* This figure is taken from my monthly returns. It is possible many of the cases may have recurred several times in the year.

Of the above diseases none assumed epidemic dimensions with the exception of influenza. This disease appeared about the middle of October, and continued with more or less severity until the end of the year. The type was both severe and varied, and it claimed many victims, especially among the old.

Pulmonary tuberculosis unfortunately maintains its strong position, and will continue to do so until the habits and circumstances of the people improve. Two of the cases of tetanus occurred in adults.

The sanitary condition of the district remains just the same as in previous years, and the water supply has only been improved in a small portion of the district.

Three hundred and eleven children under 1 year old were vaccinated during the year. In addition to these quite a large number of adults were vaccinated for various reasons.

The attendances under the Medical Relief Scheme were as follows: Free, 4,780; payment, 1,101; deferred payment, 583; vaccinations, 311; deaths, 140: total, 7,035.

W. A. D. Whiteman.

District No. 7.—St. Andrew's.

St. Andrew's Parish is divided into three medical districts. Public roads form the boundaries. The population of No. VII and VIII Divisions are about equal. The Medical Officer of No. VI District attends also a portion of St. Patrick's Parish.

The free prescriptions give a rough estimate of the distribution of the population: No. VI District, 492; No. VII District, 2,571; No. VIII District, 2,227.

In No. VII District the number is, of course, exclusive of those written for the St. Andrew's Hospital. I estimate the inhabitants of this division of the parish to be 8,000 persons.

The births and deaths for the last five years of the entire parish are set out for comparison:—

1905: births, 725; deaths, 409. 1906: births, 661; deaths, 444. 1907: births, 661; deaths, 331. 1908: births, 731; deaths, 400. 1909: births, 660; deaths, 422.

October, November, December, and January are the most unhealthy months of the year. The rain falls sufficiently in these months to keep pools and ground depressions filled with water, in which mosquitoes breed. Malaria then ensues.

The general health is best in the dry season; February, March, April, and the greater part of May constitute that season.

The wet season consists of the months of June, July, August, and September, when enteric diseases frequently prevail.

In September diarrhœa and dysentery appeared in the district, but did not assume an epidemic proportion.

In November an epidemic of influenza occurred. It was remarkable from the fact that so few persons escaped an attack.

A wet year materially affects the death-rate in this parish, which has a marshy coast line.

The deaths ascribed to malaria are 73 in comparison with 32 the previous year.

Since the return of labourers from Panama and elsewhere venereal diseases have been very prevalent. The increase in the number of stillbirths must also be ascribed to the same facts.

Yaws.—Its prevalency may fluctuate each year; nevertheless, it is by no means so frequently to be seen as ten or fifteen years ago.

Uterine and mammary cancer were met with in the course of the year in persons of African descent. Both sexes smoke short clay pipes and strong tobacco, yet epithelioma of the lips or tongue is rarely seen in the island.

Alcoholism is not uncommon. The cheapness of rum is the ruin of the peasantry, whose money is lost for useful purposes by its purchase.

Ankylostomiasis is rarely met with. Labourers live in detached houses with cocoa cultivation between them. The soil in the vicinity of their dwellings is less likely to get infected than it is near crowded barracks on sugar estates.

General sanitary condition of district is good. The rugged surface of the country is favourable to drainage. Every ravine from the hills has a rapidly flowing stream. The trade winds keep the air in circulation and temper the heat, and sunlight penetrates everywhere.

Labourers live mostly in the open air: the doors and windows of their houses are wide open during the daytime, and they often take their meals and rest outside. At night large families are crowded into a small space and the ventilation of their dwellings is a matter of accident.

Grenville is certainly more cleanly looking than it has been for years. The District Board has laboured hard to improve the drainage of the swamp on which the town is built. When the rain temporarily remains in the hollows mosquitoes breed and fever ensues.

Much ill-health, especially malaria, will be saved through the District Board's ready adoption of the scheme presented by His Excellency Sir James Sadler.

One hundred and ninety-two primary vaccinations were effected in No. VII District and about half that number were re-vaccinated when emigrating. Grenada is a well-vaccinated island.

There is need of sanitary regulations with respect to premises where food is stored or prepared. Bake-houses and aerated water factories demand small capital to start, so specially require supervision.

N. S. DURRANT.

DISTRICT NO. 8.—ST. ANDREW'S.

Owing to St. Andrew's Parish having been divided into three medical districts, it is impossible to obtain the exact data necessary for calculating any changes in the population; I must, therefore, compare the number of infantile vaccinations with the deaths. The number of vaccinations on infants was 259; the number of deaths, certified and uncertified, was 169: the difference (90) shows the increase of population for the year; but from this number a deduction must be made of the emigrating labourers who went to Panama and other places to find work.

The months of October and November were the most unhealthy; but January and December produced a large amount of illness from malarial fevers of a non-fatal type.

There were 157 deaths certified during the year, but the death-rate was in no way excessive.

The rainfall for the year in this part of St. Andrew's Parish, as recorded on Bellevue Estate, was 107.3 in.; this was the heaviest fall since 1901.

Pulmonary tuberculosis was frequently met with: this disease is certainly gaining ground in Grenada, and its infectiousness through the sputum is beyond doubt. In one small area of my district I had four deaths from phthisis in a few months. The first case was that of a cleanly respectable woman who used to bake bread for her livelihood; the second was also a woman, who frequently helped the other at the oven, but was not related and lived in her own house; the third was a man who was on extremely intimate terms with the second woman, although he also lived in his own home; the last victim was the daughter of No. 2 case. Besides showing how easily consumption is acquired by close personal contact, these cases certainly show how desirable it is that people suffering from such complaints should be prevented from dealing with foodstuffs which are afterwards to be consumed by the public.

In the conveyance of this disease from person to person the common house-fly probably plays a very important part; the tubercle bacillus is readily carried by these insects from the sputum of consumptives to articles of food. In my opinion, all persons suffering from pulmonary tuberculosis, if not living in sanitary surroundings, should be removed to a special hospital where the proper "open-air" and other treatment could be carried out.

Cancer.—This terrible disease was too frequently seen; women were the chief sufferers.

Enthetic diseases were much in evidence again; but the type of syphilis mostly seen was a mild one.

Yaws was more prevalent in this district during 1909 than in 1908; the present arrangements for its arrest are very inadequate.

The general sanitary condition of the district seemed to be gradually improving; but very little sanitation work could be undertaken by the local authorities.

Malarial fevers and dysentery appeared to be milder than usual.

Persons suffering from the ankylostoma worm were often seen, although I do not think ankylostomiasis is on the increase in Grenada.

Vaccination was most thoroughly carried out; 292 inoculations with the excellent lymph supplied by the Government were successful. The population of this island is now so well vaccinated that the

prospects of a visitation by small pox, in any serious form, should be very remote.

As regards the general health of the inhabitants there is nothing very satisfactory to report. Wages are still small, and work, at certain seasons, very scarce. Burials in unsuitable places are still very common in this district; it is a great pity that free graves cannot be granted for poor people unless they are absolute paupers.

The public water service dispensed its blessings with due regularity. I sincerely hope that the District Board will see their way to extend the supply in the near future; good roads and good water go a long way in promoting sanitation.

The midwife question is still a very serious one. The old licensed women are fast dying out or becoming too infirm to carry on their rather exhausting work. A system of training a few selected probationers near the Colony Hospital, where a small maternity ward should be established, has suggested itself to some of us as the most practical way of getting a renewed supply of these most necessary public servants.

The following table shows at a glance the amount of official duties performed during the past year: Free prescriptions, 2,451; payment prescriptions, 1,071; deferred payment tickets, 52; paupers, 414; labourers' children, 1,754; aged labourers, 247; labourers, 1,456; labourers who paid, 630; deaths certified, 157; vaccinations, 292; total attendances, 4,582.

The paupers are steadily increasing in number; and the fees payable by young labourers, under the Government tariff, are steadily diminishing.

H. J. Lee Bennett.

District No. 9.—St. David's.

The estimated population for 1909 = 6,727. Births during 1909, 255; deaths during 1909, 158; birth-rate per 1,000, 38.76; death-rate per 1,000, 23 83. 1908: estimated population = 6,630; births 373, deaths 162. 1909: estimated population = 6,727; births 255, deaths 158.

The total births for the year did not reach the previous year's figures, being 118 fewer; the deaths recorded were 4 less. There were 38 deaths among children under 1 year and six still-births reported. The usual cause of death among these in this parish was gastro-intestinal troubles. This cause forms a recurrent item in each year's report.

The parish as a whole was not as healthy as in 1908; no disease, however, assumed epidemic form, and no infective notifiable disease was met with. The death rate was also less. In spite of all these there were considerably more cases treated than during the previous year.

The mortality was heaviest during the last quarter of the year.

The rainfall during the year was regarded by all as a record one. It was wet throughout the entire year; nevertheless, this continuous rainfall had no appreciable effect on the prevalence or virulence of any particular disease.

Malarial fevers were again plentiful, more so than in the previous year. The types were quotidian and tertian.

Yaws was, I am glad to say, not often met with, and I believe this disease is decreasing in this parish.

Ankylostomiasis, which was seen rather frequently at one time, showed marked diminution in the number of cases treated during the year, and the same might be said of pulmonary tuberculosis.

There were 201 successful vaccinations performed during the year. The lymph supply was fairly good; a few tubes about the middle of the year did not give that uniform series of good results that we have grown accustomed to since the introduction of this brand of lymph. Free prescriptions issued during the year, 456; payments, 1,527; deferred payments, 382; attendances on paupers, 572; labourers' children under 10 years, 513; labourers over 60 years, 17; destitute women in childbirth, nil; on constables and prisoners, 4; labourers under scale of charges, 1,746; inquests, 4; licence granted to midwife, 1; causes of death certified, 178; successful vaccinations, 201; unsuccessful vaccinations, 6.

G. N. Alexis.

District No. 10.—Bellevue Hospital, Carriacou.

Vital Statistics.—Estimated population at end of year, 7,788; total number of births, 218; birth rate per 1,000, 26.7; total number of deaths, 87; death-rate per 1,000, 11.1; number of still-births, 14.

The birth-rate, it may be remarked, is steadily falling, being 38.4 per 1,000 in 1904 and 26.7 in 1909.

As to deaths, the total number, as well as the death-rate, bears favourable comparison with anywhere else, and the figures are most instructive.

Of the total, twenty-one were very old people, of an average age of 82 years, one aged 125, one aged 104 years, and three over 90 years. Nineteen deaths were of children under the age of 2 years; of these five were the direct result of incompetent midwives.

Prevailing Diseases.

Enteric fever was epidemic from January to September; la grippe, or an ill-defined fever, occurred in epidemic form in October and November, and malarial fevers assumed a very virulent form towards the end of the year.

Phthisis Pulmonalis.—This disease appears to be on the increase. Bad ventilation, insufficient and poor food, are two of the factors which facilitate the spread of this disease.

Every practitioner here has recorded the fact that phthisis is a disease which speedily proves fatal. It is now an established fact that these rapidly fatal cases are due to mixed infection, *i.e.*, pus and other organisms superadded to the tubercular infective. With these facts kept in view the fate of the consumptive can certainly be made less abrupt.

Pyorrhea Alveolaris.—Bad decayed teeth are becoming increasingly common among adults and children. With decayed teeth come the inevitable sequence of indigestion, weariness, anæmia, and general ill-health, which can only be cured by attention to the causative factor.

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The deterioration of the teeth is almost entirely a question of food. In the days when sugar-cane formed an article of diet, the eating thereof scrubbed the teeth, and mucus, food and bacterial products were washed away from the teeth and its cavities. The change to a softer diet has brought the advent of decayed teeth, which any observer may note, and a "moss-grown gravestone" is an apt comparison to many of the teeth we now see.

Malarial Fevers.—These assumed their greatest virulence at the close of the year: the death roll, however, was very small, chiefly because every case of malarial fever was diagnosed with the help of the microscope and treated by the *hypodermic* use of quinine; it cures the patient in a very little while, and with ordinary care is free from any disturbance.

Eruptive Fever.—Four cases of this form of official small-pox occurred in the district; they were also seen by Dr. Whiteman and the diagnosis confirmed.

After many years, and with thousands of cases under every condition of life, this disease has not yet caused either a death or a serious illness.

Certainly the success which has attended the efforts of our neighbours and has rid them of this inconvenient disease, and still more effectually prevents its reintroduction, deserve to rank among the triumphs of modern preventive medicine.

Water Supply.

It is very satisfactory to record that, thanks to the enthusiasm of the Commissioner, the water supply of Carriacou is very much better than formerly.

The water supply is obtained mostly from common ponds and wells, and a few cisterns for storing rain water; the sources, therefore, are peculiarly open to every form of infection, yet it is notorious that the island is especially free from all forms of water-borne diseases, and the recent epidemic of enteric fever was confined to a few villages, and the source of infection was established as being due to food supplies obtained from a single grocer's shop. The history of the epidemic confirms also the fact that enteric and similar germs causative of typhoid fever can only live for a very short while in ordinary drinking water, as they readily fall victims to the saprophytic organisms ordinarily present in water.

The force of this, as applied to everyday life, is that tap and ordinary water is safer than boiled and filtered water, unless such filtered water be kept efficiently protected from subsequent contamination.

The work of the physician is incomplete unless, in addition to pointing out an evil, he can suggest a practical remedy therefor.

One of the greatest means at our disposal is, I am sorry to say, not being utilized as it might be; I refer to the education of school children in elementary sanitation and hygiene. There can be no doubt that if the children *understood* and appreciated the rudiments of sanitation a great improvement would result both in individual and in public health; education of school teachers and children in hygiene has possibilities of infinite good for the colony, and I would tentatively suggest that the teachers be educated in that subject first before they attempt to impart the knowledge to their pupils.

DUNBAR HUGHES, M.B., C.M.Ed.

MEMORANDUM FROM THE COLONIAL SECRETARY TO ACCOMPANY THE MEDICAL REPORTS FOR 1909.

In submitting the reports for the year 1909 of the medical officers of this colony, it will probably be convenient for me to refer to my remarks to the conditions at date.

The conditions in 1909 were fairly satisfactory, and no disease, except a mild form of influenza in the last quarter of the year, can be said to have been epidemic. Mumps was prevalent in some of the districts in the early part of the year.

Typhoid Fever.—There was once more an outbreak in the town and parish of St. George's, but only thirteen cases with one death occurred, as compared with twenty-two cases and five deaths in the previous year. In Carriacou there was a more severe outbreak, sixty-six cases with seven deaths occurring. It was checked by treatment of the cases in the district hospital with the proper precaution, and by disinfecting the premises in which each case occurred. Cases of this disease have in the past been rare in Grenada.

Malarial Fever.—As the medical officers unite in remarking, the type of malarial fever usually met in Grenada is mild, and the death-rate from it small. An important feature of the year under review is the marked diminution in the number of cases in St. George's town and parish as compared with the year 1906. This result is directly traceable to the efforts made by the Government, commencing early in 1907, to reduce the number of mosquitoes in the principal town and its vicinity, in view of the prevalence of yellow fever, first in Trinidad and next in Barbados. The regulations made and the active steps taken are producing their natural result, and the more recent measures just adopted are designed to extend to the whole colony the improvement which is noticeable at headquarters.

Yaws.—The average annual expenditure on this disease in the last five years has been £800, and it takes the shape of providing a hospital at headquarters for treatment of cases sent in compulsorily or otherwise. Four hundred and twenty cases were treated at this institution in 1909, of whom 339 were discharged as cured, but, as some of the medical officers point out, many of these get reinfected on returning to their homes. The net effect of the existence of this hospital, which, with a short break, has been at work since 1883, appears to be that in the districts adjacent to it yaws is far less prevalent, only a few cases being now met. In the rest of the island, however, it prevails much as before. In Carriacou there are but few cases, and care is taken to send them into hospital as soon as detected. Throughout the colony the treatment of this disease is placed on the free list, both as regards medical attendance and medicines.

Small-pox.—Four cases occurred in Carriacou of the disease which has come to be described in these islands as "official" or "convention" small-pox; the latter term being due to the fact that the Central Authority under the Quarantine Convention definitely legalized it in 1907 as small-pox, whereas previously it had prevailed under the name of "eruptive fever," or (in Trinidad) "varioloid varicella." The Medical Officer of the No. 10 District has contributed in his report some interesting remarks on this disease. As will be seen from the several reports of the medical officers, Grenada is now a well-vaccinated colony, but however useful this may be in guarding against the real disease it does not protect from the local form of it, as it is quite as easy to successfully vaccinate a patient suffering from it as a healthy person not afflicted with it.

Pulmonary Tuberculosis.—This disease is on the increase, and in view of local conditions, which are fairly well described in the report on District No. 8, this is not to be wondered at. To face the enemy and effectively deal with it on correct lines is out of the question at present for financial reasons, but an effort is about to be made to do what is practicable, and that is to isolate and treat twelve of the worst pauper cases, who are now a standing danger to the community by wandering about spreading infection through the *sputum*, and themselves suffering the greatest hardship on account of the difficulty of obtaining lodging for them. A barrack hospital is to be built immediately with this object. Inquiry is also being made as to the feasibility and usefulness of adopting the suggestion made by the Medical Officer of the No. 10 District of issuing free disinfectants to sufferers of the poorer classes, so as to diminish the risk of infection by the *sputum*.

Ankylostomiasis.—As will be gathered from the reports, this disease, although present, does not appear to be gaining ground, probably because the labourers do not live together in groups on the estates as in the larger colonies. It is, however, necessary to prevent its further spread, and an ordinance on the subject became law on June 1, 1910, giving ample powers to the sanitary authorities in the matter of latrine accommodation, &c., defæcation in the open being a common and serious nuisance.

Syphilis.—It is regrettable that nothing hopeful can as yet be said under this head. It will be noted, however, that it is chiefly in the principal towns, St. George's and Grenville, that it appears "to maintain its prevalence," as Dr. Paterson puts it. The reports of the rural districts are fairly satisfactory in this respect, and show that it is not gaining ground in the country.

Sanitary Improvements and Measures.

In the above remarks reference has been made to some of the improvements which have been introduced or are in view, and it may be of interest to record here some other details of sanitation which are receiving the attention of the Government.

Water Supplies.—In the last three years the water supply to the town of St. George's has been much improved and extended to adjacent portions of the parish. In 1908 the district of Beaulieu, within two or three miles of the town, was thus supplied, and in 1910 an extension was effected to the Belmont suburb of the town. The beneficial result of these works is referred to in the reports of the first and Third Medical Districts. The village of Mt. Moritz, inaccessible to the St. George's pipe supply on account of its situation on a mountain, has this year been given a large tank, which is proving a great assistance to the people.

The year under review witnessed the laying of a pipe-borne water supply to the town of Sauteurs, and great good may be expected to result from it. The works are not yet quite completed, but the town has been supplied with water for more than a year.

The town of Victoria is the only one now without a proper water supply. The question was investigated some years ago, and a project formed, which failed of accomplishment at the time through lack of funds. The matter is now again under discussion, and it is to be hoped that on this occasion something will be found possible in this direction, as a recent survey has shown the town (population about 2,000) to be infested with *Stegomyia* mosquitoes, resulting from storage of water in barrels, &c.

In Carriacou there has been marked improvement in the water supply of late years since the island has been taken in hand. Formerly it was necessary every year during the dry season to send water from Grenada to the dependency, but this expensive method of supply has not had to be resorted to now for some years.

Drainage.—In the town of St. George's much improvement, as the medical officer points out, resulted from the drainage operations on the Tanteen Lands, which commenced in 1905, but something still remains to be done at this spot before it can be regarded as completely drained. There is, however, a fair prospect of its being drained soon, as a scheme is in hand for converting it into a racecourse and place of popular recreation, and, if a certain portion of the funds required are forthcoming by popular subscription, the Government are to give a grant-in-aid of £1,000.

Further drainage within the St. George's town boundaries is being undertaken this year by the Government—there being some swampy lots which harbour mosquitoes on the border of the Carenage.

For the town of Grenville an important scheme of drainage has been just prepared by the Public Works Department, the cost of which, if adopted, will be spread over several years. As parts of the town lie below sea level there is much accumulation of storm waters after heavy rain, and pumping of some kind will have to be resorted to.

At the town of Gouyave there is a low-lying portion known as "L'Ance," which is in a swampy state, and, aided by a grant from General Revenue, the District Board are this year carrying out drainage operations which are expected to much improve the conditions.

Near to the town of Sauteurs are the Marli Lands, which retain water to the detriment of the health of the immediate neighbourhood, which is fortunately not thickly inhabited. By an improvement of the

culverts, which is now being attempted by the Public Works Department, it is expected that a better flow of the water will be secured.

In the case of the larger collections of water in the colony generally, which it is not possible to drain, an attempt is being made to reduce the mosquito larvæ by the introduction of the little fish known as "Milliens." In the island of Grenada it is yet too early to record the success or otherwise of the effort, but the Commissioner of Carriacou reports that this year there has been a remarkable reduction of the number of mosquitoes in the neighbourhood of the town, which he attributes to stocking the adjacent swamp with these useful little fish. The ponds at Islet Ronde, a cay attached to the No. 5 District, and which the medical officer refers to as being a stronghold of malarial fever, have recently been thus supplied.

Cemeteries.—As in previous years, some of the medical officers touch upon the unsatisfactory conditions relating to burials in the rural districts. All necessary data for the provision of new cemeteries were obtained some years ago, and it is now only a question of providing the funds for purchase and equipment of the additional ones which are required, suitable land being both difficult to obtain and expensive. In the meantime inquiries are being made of the District Boards this year with a view to carrying out some improvement by securing a reduction to the lowest possible amount of the fees chargeable at the existing burial places.

Rat Extermination.—The Health Officer of the Port of St. George's refers in the last paragraph of his report to the protection against the introduction of plague which is afforded by the operation of the Rats Ordinance 1909, a measure which, in addition to providing machinery for dealing with the rat nuisance on land, enables vessels lying in the waters of the colony to be freed from these rodents by fumigation or other adequate measures directed by a medical officer. A definite campaign against rats was commenced in Grenada in 1908, and untold numbers have since then been destroyed on land by use of poison and virus (*Danysz*), and by the payment, under proper control of the expenditure, of one penny apiece for each animal brought to a District Board Office. In one town alone 6,000 were thus paid for within six months. Fumigation of the small craft, which carry on most of the intercolonial trade, and which lie up at the wharves in the several colonies, has proved beyond a doubt that they frequently arrive here with rats on board, and it is obvious that it is a preventive measure of the first importance to destroy those rats before they land. The efforts of the Government in this direction both on land and water are being continued, and an attempt is being made to enlist the sympathetic co-operation of the people themselves.

Sanitary Inspection.—The Local Health Authority in each parish is the District Board, and although on the whole an intelligent activity is shown by them and their officers in sanitary matters experience has proved that additional inspection by officers responsible to the General Board of Health of the colony is highly desirable. Power was taken in the Health Ordinance of 1902 to provide such inspection, but it has only recently been brought into operation by the appointment of two District Sanitary Inspectors for the Island of Grenada. The Governor and the members of the Executive Council constitute the Board of Health.

Hospitals and Asylums.

The reports for 1909 on the institutions disclose satisfactory conditions, and these, so far as it is possible for one who is not an expert in such matters to pass an opinion, may be taken to exist in the Grenada charitable institutions. Improvements are, of course, still necessary in some cases and are receiving attention. Of the more important of these may be mentioned (1) the provision of a separate lying-in ward at the Colony Hospital and the construction of quarters there to enable a European matron to be appointed; and (2) the construction of a water-closet sewage system at the Lunatic Asylum, funds for which works it has just been possible to provide, and which will be commenced very soon. The lying-in ward and trained matron will enable the Government to provide for the crying want of proper midwives in the colony, the present supply being unequal to the demand, and the women who attend in this respect to the poorer classes being frequently so inefficient as to constitute a danger in some instances.

The improved latrines and other structural alterations have been completed this year.

EDWARD DRAYTON,
Colonial Secretary.

Grenada,
November 24, 1910.

THE PUBLIC HEALTH ORDINANCES, 1902 AND 1905.

Regulation for declaring certain rank growing bush, plants, vegetation, &c., in towns or in the neighbourhood of human habitations, to be statutory Nuisances.

(Gazetted November 15, 1910.)

Under and by virtue of sections 11 and 23 of The Public Health Ordinance 1902, the General Board of Health hereby declares to be a nuisance, liable to be dealt with summarily under the provisions of the said Ordinance:—

Any of the undermentioned trees, plants, or vegetation, being within any town or in close vicinity to any human habitation, viz.: (1) Vegetation, bush, or trees so rank and thickly growing as to prevent the free circulation of air, or the penetration of sunlight under or through the same; (2) parasitic plants, such as "Wild Pines" (*Bromeliaceae*), growing on trees or rocks, and capable of holding stagnant water in which mosquitoes may breed; (3) trees, or stumps of trees or of bamboos, containing holes capable of holding stagnant water in which mosquitoes may breed; (4) water-holding plants which provide a place wherein mosquitoes may breed.

Made by the General Board of Health this 10th day of November, 1910.

C. N. RICE,
for Clerk to the General Board of Health.

Colonial Medical Reports.—No. 12.—Sierra Leone.

MEDICAL REPORT FOR THE YEAR 1909.

By R. M. FORDE.

Principal Medical Officer.

Public Health.

The estimated population of the Colony proper was 78,410. The deaths registered numbered 1,353 and the total births 1,152. As, however, registrations in the Colony are not compulsory these figures should not be considered reliable. In Freetown, where registration is more strictly carried out, the deaths and births figures are more reliable.

The estimated population of Freetown was 39,531, and there were 760 deaths and 549 births registered during the year, giving a death-rate and birth-rate of 19 per thousand and 13 per thousand respectively, both being lower than the previous year.

The largest proportion of deaths in Freetown was due to the following diseases: Malarial fevers, 119; nervous system, 111; respiratory system, 108; digestive, 106; debility, 86; circulatory system, 37.

Of the total number of deaths registered, 188 occurred under the age of one year, showing a death-rate of 344 per thousand infants; this compares very favourably with the past seven years, and is a further improvement on that of the last two years. The infantile death-rate for the past eight years is shown here: 1902, 466; 1903, 471; 1904, 388; 1905, 461; 1906, 434; 1907, 357; 1908, 351; 1909, 344.

Health of European Residents.

The general health of Europeans was satisfactory; the death and sick rates were below the average.

The actual European resident population in the Colony is estimated at 620, consisting of: Government officers, 155; military, 344; commercial, &c., 121.

Among these there were four deaths during the year, due to the following causes: Apoplexy, 1; blackwater fever, 2; malarial cerebral thrombosis, 1.

There were three deaths among patients landed from vessels: Malignant malaria (hyperpyrexia), 2; blackwater fever, 1.

Official Sick Rate.

The total official strength for the year was: Europeans, 155; natives, 46; total, 201.

Among the former there were seventy-one admissions on the sick list, among the latter 498.

There were two deaths among European officials in the Protectorate: one due to a growth in the brain, ending in apoplexy; the other was due to dysentery, aggravated, as later accounts went to show, by excessive use of alcohol and want of proper medical attention, which was out of reach.

The official sick rate for Freetown for the past five years is shown in the following tables:—

1.—All Officials.

	1905	1906	1907	1908	1909
Total number on sick list	366	308	372	405	569
Total number of days on sick list	2,593	2,299	2,483	2,099	3,621
Average daily number on sick list	7.10	6.28	6.80	5.73	9.90
Average number of days on sick list	7.08	7.46	6.67	5.16	6.39

2.—European Officials.

	1905	1906	1907	1908	1909
Total number on sick list	82	68	73	60	71
Total number of days on sick list	680	531	561	305	512
Average daily number on sick list	1.8	1.45	1.53	.83	1.40
Average number of days on sick list	7.28	7.80	7.68	5.08	7.21

3.—Native Officials.

	1905	1906	1907	1908	1909
Total number on sick list	284	240	299	245	498
Total number of days on sick list	1,913	1,768	1,922	1,787	3,109
Average daily number on sick list	5.24	4.84	5.26	4.89	8.51
Average number of days on sick list	6.77	7.36	6.42	5.17	6.24

The following deaths and invalidings occurred among officials (Colony and Protectorate):—

Europeans.—Deaths, 2; invalidings, 6. Causes of deaths: Apoplexy, due to tumour of the brain, 1; dysentery, aggravated by alcoholic excess, 1; in Protectorate. Causes of invalidings: Malaria, 3; necrosis of bone, 1; lachrymal fistula, 1; mental aberration (temporary), 1.

Natives.—Deaths, 3; invalidings, *nil*. Causes of deaths: Diarrhœa, 1; tuberculosis, 1; lightning stroke, 1.

The new method introduced last year of showing the percentage loss of working days to the Government through the ill-health of European officials is again shown in the following: Total number of European officials resident in the Colony and Protectorate during any portion of the year, 155; total number of days spent by them in residence, 36,060; total number of days spent by them on sick list, 512; percentage of days lost to the service, 1.41.

The second-class European railway officials, as usual, account for a large proportion of days on sick list; with the low sick rate there were, however, two deaths, both in the Protectorate, and six invalidings.

[For Contents see page ix.]

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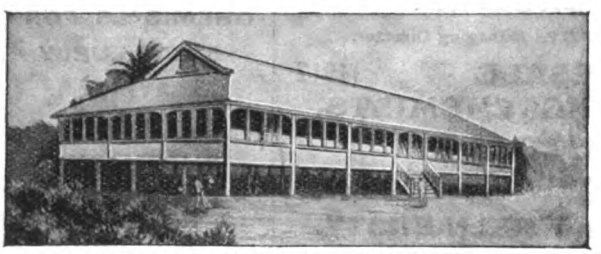

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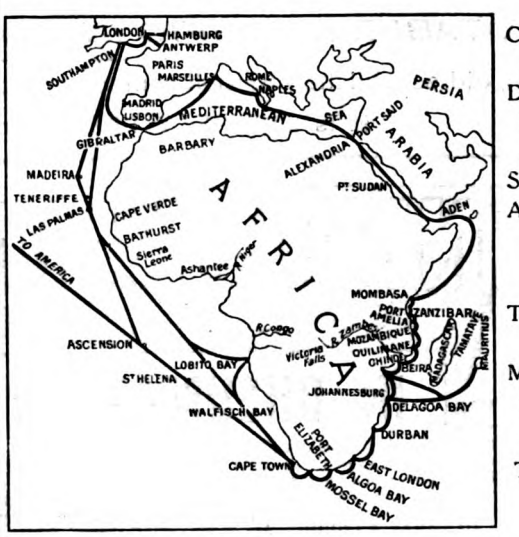

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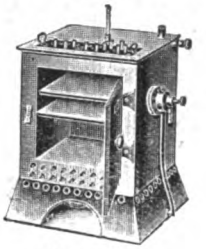

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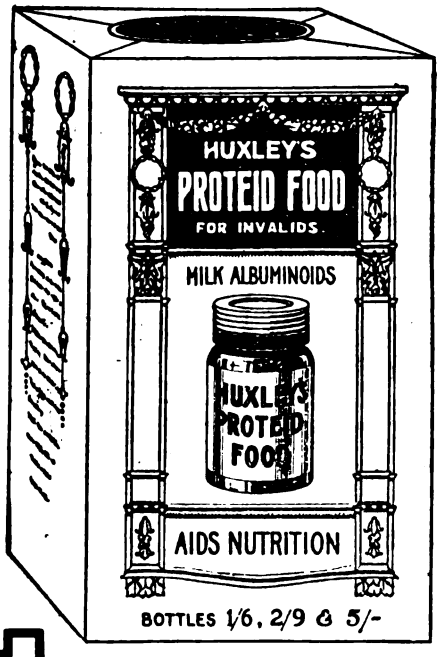

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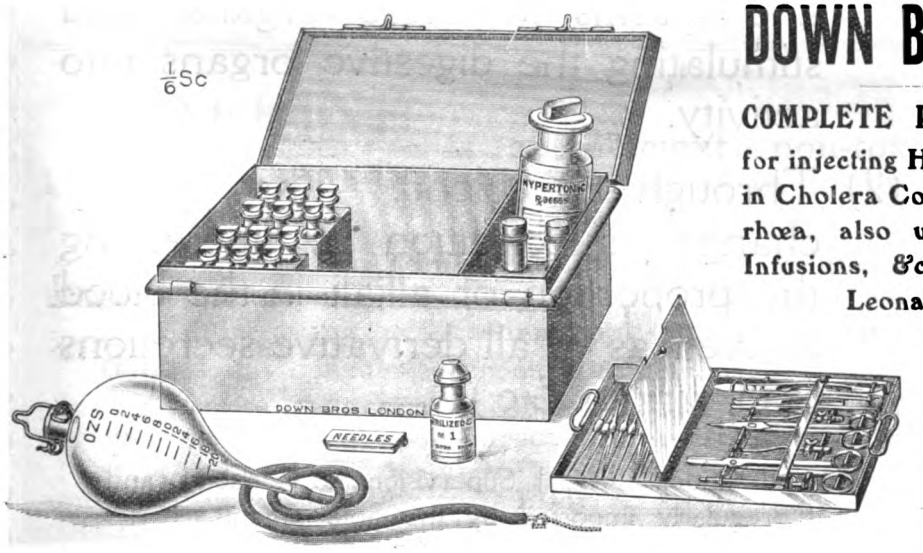

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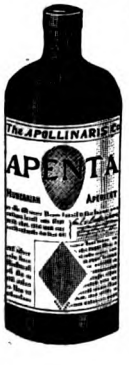

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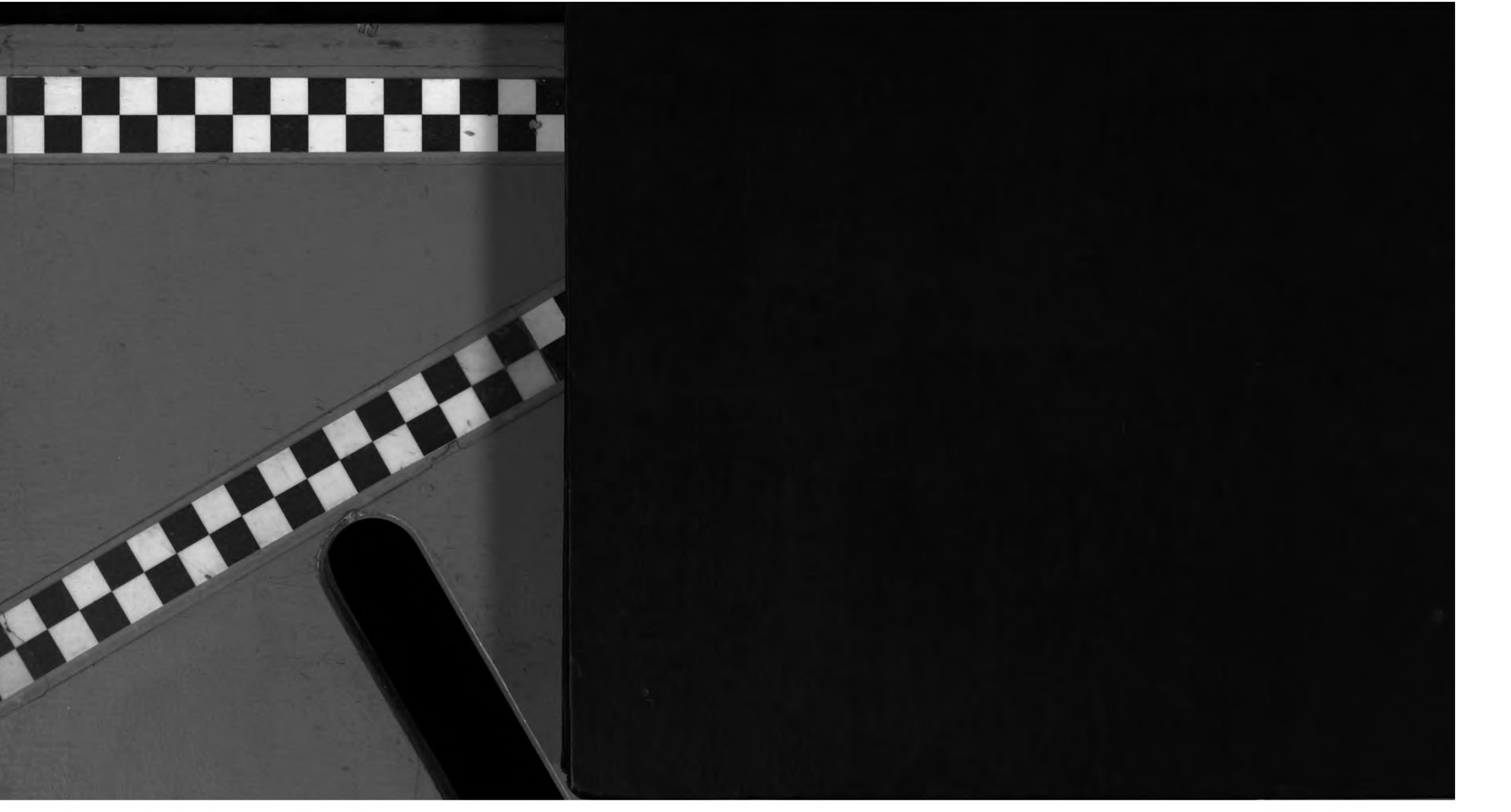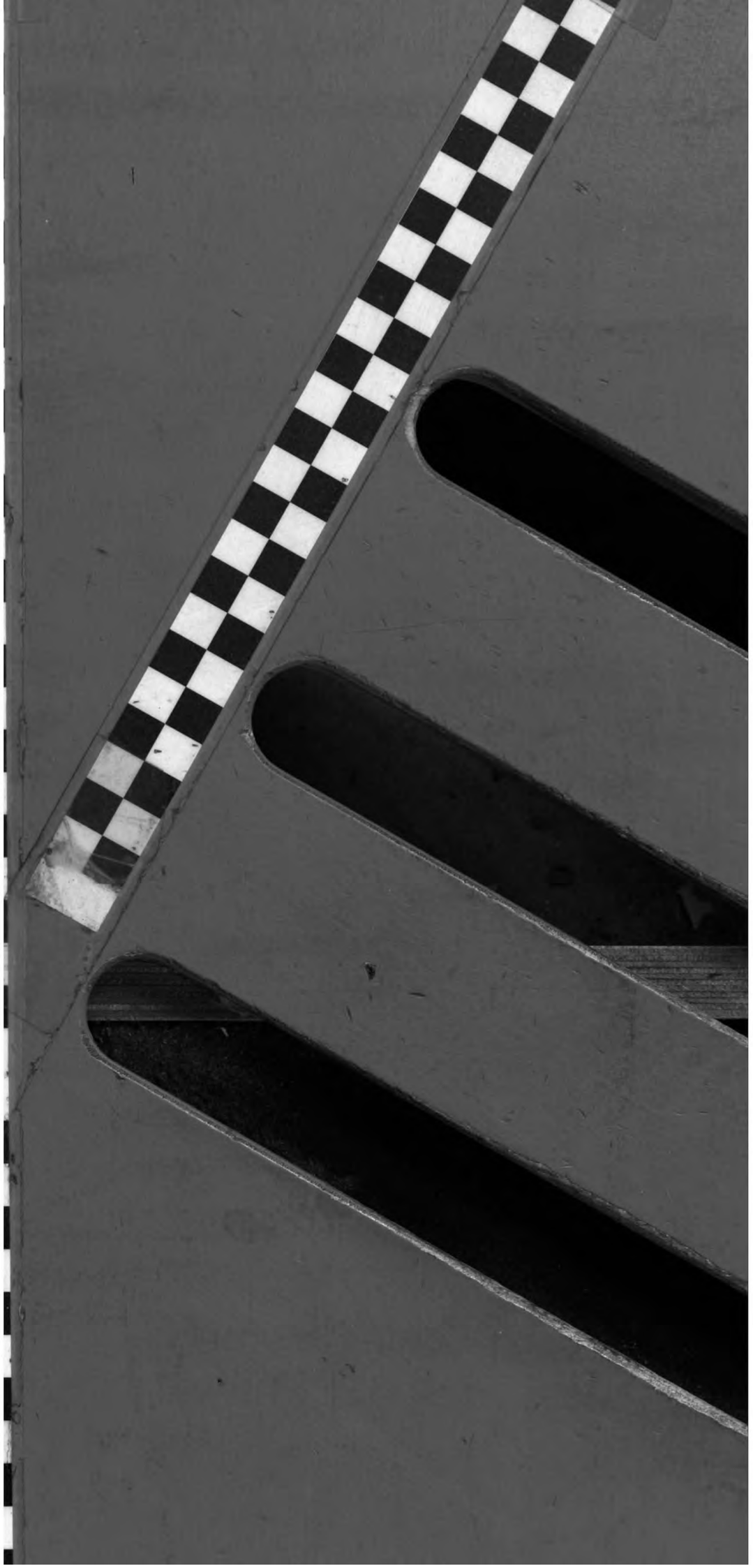
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